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# OPERATOR'S AND ORGANIZATIONAL MAINTENANCE MANUAL FOR TELETYPEWRITER SETS AN/FGC-25, AN/FGC-25X, AN/FGC-26, AN/FGC-26X, AN/FGC-52, AN/FGC-52X, AN/FGC-57, AN/FGC-68, AN/FGC-161, AN/FGC-162, AN/UGC-30 AND AN/UGC-30X

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## WARNING

DANGEROUS VOLTAGES EXIST IN THIS EQUIPMENT

Be careful when working on the 115-volt motor circuits, or on the 95- to 250-volt power supply circuits.

## DON'T TAKE CHANCES!

This equipment contains selenium rectifiers which immediately release poisonous fumes when they burn out. The fumes are very toxic and have strong, unpleasant odor resembling the smell of rotten eggs. Whenever this odor is detected, IMMEDIATELY disconnect power and thoroughly ventilate the area. Do not handle the burned-out rectifier until it cools. PERMANENT INJURY OR DEATH MAY RESULT FROM PROLONGED BREATHING OF THE FUMES.

TM 11-5815-244-12
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C1

CHANGE
NO. 1

DEPARTMENTS OF THE ARMY
AND THE AIR FORCE
Washington, DC, 12 January 1984

# OPERATOR'S ORGANIZATIONAL MAINTENANCE MANUAL TELETYPEWRITER SETS AN/FGC-25 (NSN 5815-00-050-3316); AN/FGC-25X (5815-00-519-5644); AN/FGC-26 (5815-00-553-4710); AN/FGC-26X; AN/FGC-52; AN/FGC-52X (5815-00-688-8919); AN/FGC-57; AN/FGC-68; AN/FGC-161 (5815-00-167-1147); AN/FGC-162; AN/UGC-30 AND AN/UGC-30X

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DEPARTMENTS OF THE ARMY
AND THE AIR FORCE
WASHINGTON, D.C. *30 May 1975*

# OPERATOR'S ORGANIZATIONAL MAINTENANCE MANUAL

# TELETYPEWRITER SETS AN/FGC-25 (NSN 5815-00-050-3316); AN/FGC-25X (5815-00-519-5644); AN/FGC-26 (5815-00-553-4710); AN/FGC-26X; AN/FGC-52; AN/FGC-52X (5815-00-688-8919); AN/FGC-57; AN/FGC-68; AN/FGC-161 (5815-00-167-1147); AN/FGC-162; AN/UGC-30 AND AN/UGC-30X

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*This manual supersedes TM 11-5815-244-12, 1 March 1960, including all changes.

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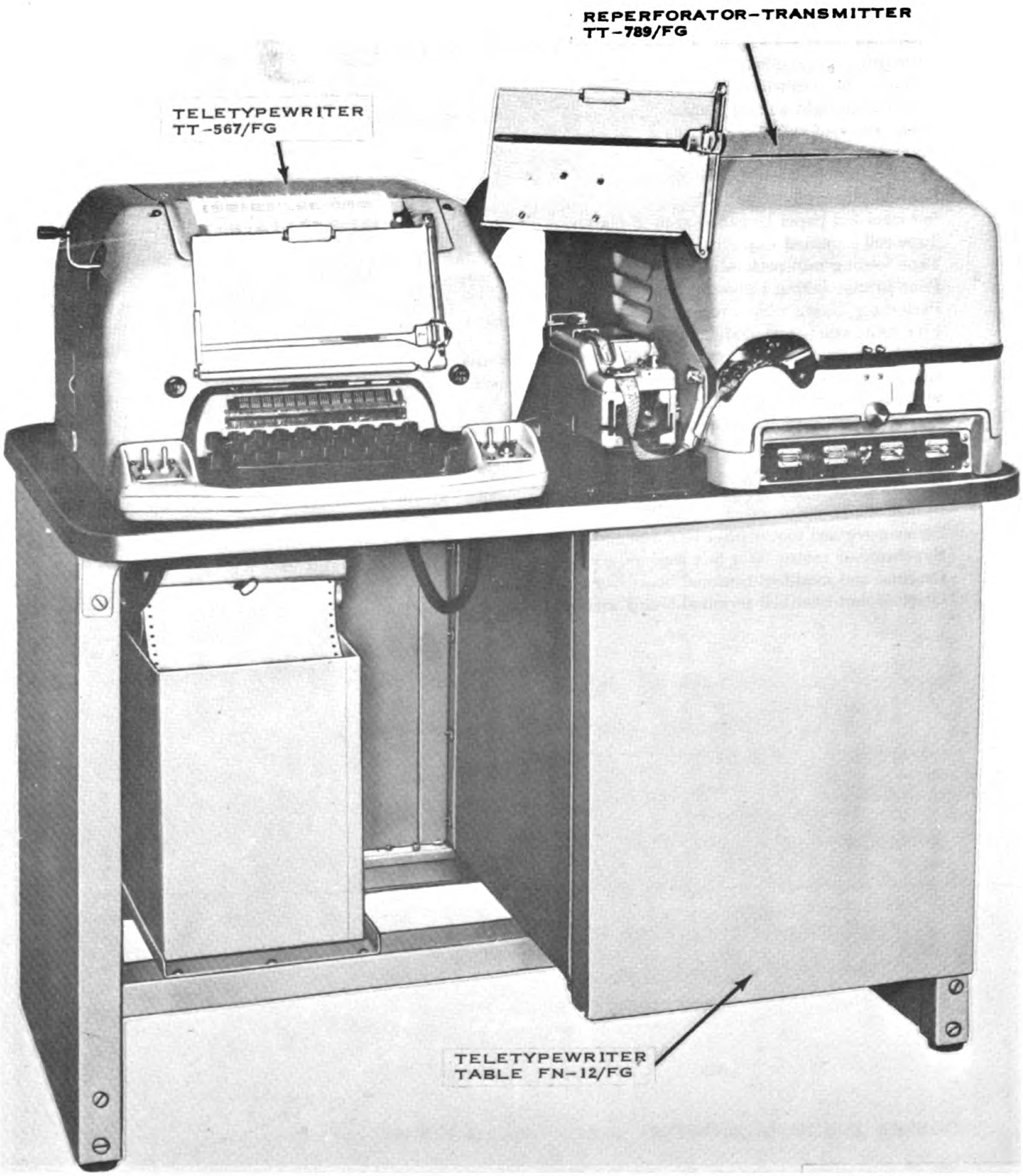

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*Figure 1-1. Teletypewriter Set AN/FGC-25(* ), less running spares.*

# CHAPTER 1

# INTRODUCTION

## Section I. GENERAL

### 1-1. Scope

*a.* This manual describes Teletypewriter Sets AN/FGC-25, AN/FGC-25X, AN/FGC-26, AN/FGC-26X, AN/FGC-52, AN/FGC-52X, AN/FGC-57, AN/FGC-68, AN/FGC-161, AN/FGC-162, AN/UGC-30, and AN/UGC-30X (fig. 1-1) and contains instructions for installation, operation, and organizational maintenance. The maintenance portion covers the cleaning and inspection of equipment, periodic maintenance services, and the replacement of parts available to organizational personnel.

*b.* The information in this manual applies equally to all models of the equipment unless specifically indicated otherwise.

### 1-2. Consolidated Index of Army Publications and Blank Forms

Refer to the latest issue of DA Pam 310-1 to determine whether there are new editions, changes or additional publications pertaining to the equipment.

### 1-3. Maintenance Forms, Records, and Reports

*a. Reports of Maintenance and Unsatisfactory Equipment.* Department of the Army forms and procedures used for equipment maintenance will be those prescribed by TM 38-750, The Army Maintenance Management System. Air Force personnel will use AFR 66-1 for maintenance reporting and TO-00-35D54 for unsatisfactory equipment reporting.

*b. Report of Packaging and Handling Deficiencies.* Fill out and forward SF 364 (Report of Discrepancy (ROD)) as prescribed in AR 735-11-2/DLAR 4140.55/NAVMATINST 4355.73A/AFR 400-54/MCO 4430.3F.

*c. Discrepancy in Shipment Report (DISREP) (SF 361).* Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38/NAVSUPINST 4610.33C/AFR 75-18/MCO P4610.19D/DLAR 4500.15.

### 1-3.1. Reporting Errors and Recommending Improvements

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms) direct to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: DRSEL-ME-MP, Fort Monmouth, New Jersey 07703.

For Air Force, submit AFTO Form 22 (Technical Order System Publication Improvement Report and Reply) in accordance with paragraph 6-5, Section VI, T.O. 00-5-1. Forward direct to prime ALC/MST.

In either case, a reply will be furnished direct to you.

### 1-3.2. Reporting Equipment Improvement Recommendations (EIR)

*a. Army.* If your teletypewriter set needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about your equipment. Let us know why you don't like the design. Put it on an SF 368 (Quality Deficiency Report). Mail it to Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: DRSEL-ME-MP, Fort Monmouth, New Jersey 07703. We'll send you a reply.

*b. Air Force.* Air Force Personnel are encouraged to submit EIR's in accordance with AFR 900-4.

### 1-3.3. Administrative Storage

Administrative Storage of equipment issued to and used by Army activities will have preventive maintenance performed in accordance with the PMCS charts before storing. When removing the equipment from administrative storage the PMCS should be performed to assure operational readiness. Disassembly and repacking of equipment for shipment or limited storage are covered in paragraphs 5-1, 5-2, and TM 740-90-1.

### 1-4. Destruction of Army Electronics Materiel

Destruction of Army electronics materiel to prevent enemy use shall be in accordance with TM 750-244-2.

## Section II. DESCRIPTION AND DATA

### 1-5. Purpose and USE (Except AN/FGC-161 and AN/FGC-162).

*a.* The teletypewriter set has facilities for the transmission, monitoring, and reception of messages in communication centers. Transmission is possible on a neutral basis from either the keyboard-transmitter or from previously punched tape processed through the transmitter-distributor. The set is equipped to make a monitor copy of transmitted messages in either page copy, printed and punched tape copy, or both. The set can receive either polar or neutral signals from the signal line. Tape may be cut before transmission to the signal line, without disturbing the signal circuits.

*b.* Teletypewriter set is equipped with gearsets which permit operation at 60, 75, and 100 wpm in a variety of applications (para 1-19). Operation at 66 wpm is possible with an additional gearset which must be requistioned as a separate item.

*c.* Teletypewriter Set AN/FGC-25 is equipped with synchronous motors and is used for standard communication message traffic at installation sites equipped with a regulated 60-cycle, single-phase ac voltage source. The keyboard-transmitter and the transmitter-distributor each transmit 7.42 unit code.

*d.* Teletypewriter Set AN/FGC-25X is equipped with series-governed motors and is used for standard communication message traffic. If may be used at installation sites that do not have a regulated 60-cycle, single-phase power source available. The keyboard-transmitter and the transmitter-distributor each transmit 7.42 unit code.

*e.* Teletypewriter Set AN/FGC-26 is equipped with synchronous motors and is used for weather communication message traffic. If requires a regulated 60-cycle, single-phase ac power source. The keyboard-transmitter and the transmitter-distributor each transmit 7.42 unit code.

*f.* Teletypewriter Set AN/FGC-26X is equipped with series-governed motors and is used for weather communication message traffic. It may be used at installation sites that do not have a regulated 60 cycle, single-phase power source available. The keyboard-transmitter and the transmitter-distributor each transmit 7.42 unit code.

*g.* Teletypewriter Sets AN/FGC-52 and AN/UGC-30 are equipped with synchronous motors and are used for standard communication message traffic at installation sites equipped with a regulated 60-cycle, single-phase ac voltage source. The keyboard-transmitter transmits 8.00 unit code. The transmitter-distributor transmits 7.00 unit code. A transmitter-distributor control box is provided to enable the transmitter-distributor operation to be controlled by an external pulsing source.

*h.* Teletypewriter Set AN/FGC-52X and AN/UGC-30X are equipped with series-governed motors and are used for standard communication message traffic. They may be used at installation sites that do not have a regulated 60-cycle, single-phase ac power source available. The keyboard-transmitter transmits 8.00 unit code. The transmitter-distributor transmits 7.00 unit code. A transmitter-distributor control box is provided to enable the transmitter-distributor operation to be controlled by an external pulsing source.

*i.* Teletypewriter Set AN/FGC-57 is equipped with synchronous motors and is used in handling standard communication traffic as part of Teletypewriter Central Office Set AN/FGC-30. It contains a table that has been modified to include the wiring needed in the special application of the equipment. The keyboard-transmitter and the transmitter-distributor each transmit 7.42 unit code.

*j.* Teletypewriter Set AN/FGC-68 is equipped with synchronous motors and is used for weather communication message traffic. If requires a regulated 60-cycle, single-phase ac power source. The keyboard-transmitter transmits 8.00 unit code. The transmitter-distributor transmits 7.00 code. A transmitter-distributor control box is provided to enable the transmitter-distributor operation to be controlled by an external pulsing source.

### 1-6. Purpose and Use (AN/FGC-161 and AN/FGC-162)

*a.* These teletypewriter sets have the facilities for the transmission, monitoring, and reception of low level, polar signal messages in communication centers. Transmission is possible from either the keyboard-transmitter or from previously punched tape processed through the transmitter-distributor. The sets are equipped to make a monitor copy of transmitted messages in either page copy, printed and punched tape copy, or both. Signals from the signal line can be received on the page printing mechanism or perforator receiver. Tape may be cut before transmission to the signal line, without disturbing the signal circuits.

*b.* The teletypewriter sets are equipped with gearsets which permit operation at 60, 75, and 100 wpm in a variety of applications (para 1-20). Operation at 66 wpm is possible with an additional gear set which must be requisitioned as a separate item.

*c.* The teletypewriter sets are equipped with synchronous motors and are used for standard communication traffic at installation sites equipped with a regulated 60-cycle, single phase ac voltage source. The keyboard transmitter and transmitter-distributor in the AN/FGC-161 each transmit 7.42 unit code. In the AN/FGC-162, the keyboard-transmitter transmits 8.00 unit code and the transmitter-distributor transmits 7.00 unit code. The transmitter-distributor in both teletypewriters are capable of being operated from a low level external pulsing source.

## 1-7. Technical Characteristics (Except AN/FGC-161 and AN/FGC-162)

| | |
|---|---|
| Type of installation | Mobile or fixed station; sending and receiving, direct wire or radio circuits. |
| Type of symbols: | |
| AN/FGC-25, AN/FGC-25X, AN/UGC-30, AN/UGC-30X, AN/FGC-52, AN/FGC-52X, and AN/FGC-57 | Standard (fig. 3-1). |
| AN/FGC-26, AN/FGC-26X, and AN/FGC-68 | Weather (fig. 3-2). |
| Type of characters | English. |
| Input power requirements: | |
| AN/FGC-25, AN/FGC-26, AN/UGC-30, AN/FGC-52, AN/FGC-57, and AN/FGC-68 | Approximately 380 watts, 95- to 250-volt, regulated 60-cycle, single-phase ac. |
| AN/FGC-25X, AN/FGC-26X, AN/UGC-30X, and AN/FGC-52X | Approximately 440 watts, 95- to 250-volt, regulated or unregulated 50-60 cycles ac. |

| | |
|---|---|
| Code transmission: | |
| AN/FGC-25, AN/FGC-25X, AN/FGC-26, AN/FGC-26X, and AN/FGC-57 | 7.42 start-stop, 5 unit code. |
| AN/FGC-52, AN/UGC-30, AN/UGC-30X, AN/FGC-52X, and AN/FGC-68 | 7.00 start-stop, 5-unit code from transmitter-distributor.<br>8.00 start-stop, 5-unit code (2 stop pulses) from keyboard transmitter. |
| Code reception | All models receive messages within acceptable range limits when the appropriate gearset is installed to match the baud rate in the use on the signal line. |
| Types of signals: | |
| Transmitted | 20 or 60 ma neutral. |
| Received | 20 or 60 ma neutral, or 30 ma polar. |
| Operational speeds: | |
| 368.1 opm gearset installed | 65 wpm with 7.00 unit code, 61.5 wpm with 7.42 unit code, and 56.9 wpm with 8.00 unit code; all equivalent to 45.5 bauds per second. |
| 404-opm gearset installed | 71.3 wpm with 7.00 unit code, 67.7 wpm with 7.42 unit code, and 62.4 wpm with 8.00 unit code; all equivalent to 50 bauds per second. |
| 460-opm gearset installed | 81.2 wpm with 7.00 unit code, 75 wpm with 7.42 unit code, and 70 wpm with 8.00 unit code; all equivalent to 56.8 bauds per second. |
| 600-opm gearset installed | 107 wpm with 7.00 unit code, 100 wpm with 7.42 unit code, and 93.6 wpm with 8.00 unit code; all equivalent to 75 bauds per second. |
| Baud rate: | |
| 45.5 | 22-millisecond impulse length. |
| 50 | 20-millisecond impulse length. |
| 56.8 | 17.6-millisecond impulse length. |
| 75 | 13.5-millisecond impulse length. |
| Motor speed | 3,600 revolutions per minute. |
| Motor type: | |
| AN/FGC-25, AN/FGC-26, AN/UGC-30, AN/FGC-52, AN/FGC-57, and AN/FGC-68 | Synchronous. |
| AN/FGC-25X, AN/FGC-26X, AN/UGC-30X, and AN/FGC-52X | Series-governed. |
| Distortion tolerances (transmitted signals) | – 5 percent |
| Bias tolerance (received signals): | |
| 368.1 opm | 40 percent maximum. |
| 600 opm | 35 percent maximum. |
| End distortion tolerance (received signals): | |
| 368.1 opm | 35 percent maximum marking or spacing. |
| 600 opm | 30 percent maximum marking or spacing. |
| Suppression of interference with radio reception | Does not interfere with radio reception at frequencies between 0.35 and 150 mc when located 1 ft or more from the radio antenna. |
| Safety shielding | Points at which potentials of 30 volts or more exist are shielded against accidental contact by personnel. |
| Surrounding temperature limits: | |
| Equipment in use | 32°F. (0° C). to 132° F. (55.6° C.). |
| Equipment in storage | −80° F. (−62.2° C.) to 160° F. (71.1° C.). |
| Minimum barometric pressure: | |
| Operating | 16.88 in. mercury (equivalent to 15,000-ft altitude). |
| In transportation | 5.5 in. mercury (equivalent to 40,000-ft altitude). |
| Other climatic conditions | Withstands high humidity and moisture in the tropics; is fungiproofed and resistant to corrosion. |
| Total weight of installed equipment | Approximately 192½ lb with full roll of paper and tape. |

### 1-8. Technical Characteristics (AN/FGC-161 and AN/FGC-162)

The technical characteristics particular to Teletypewriter Sets AN/FGC-161 and AN/FGC-162 are listed below. Except for the characteristics listed below, those in paragraph 1-7 are also applicable to these sets.

| | |
|---|---|
| Type of symbols | Standard (fig. 1-9). |
| Input power requirements | Approximately 380 watts, 95 to 250 volts regulated 60 cycle, single-phase ac. |
| Code transmission: | |
| AN/FGC-161 | 7.42 start-stop, 5-unit code. |
| AN/FGC-162 | 7.00 start-stop, 5-unit code from transmitter-distributor.<br>8.00 start-stop 5-unit code (2 stop pulses from keyboard-transmitter). |
| Type of signal | Polar. |
| Motor type | Synchronous. |
| Distortion tolerances (transmitted signals) | Not applicable. |
| Bias tolerance | Not applicable. |
| End distortion | Not applicable. |
| Current delivered to teletypewriter contacts in mark condition | 60 ± 5 microamperes. |
| Voltage across teletypewriter contacts in space condition | 1 ± 0.5 volts. |
| Voltage across selector magnet in a mark or space condition | 13.5 ± 0.5 volts. |

## 1-9. Items Comprising an Operable Equipment

*a. Teletypewriter Sets AN/FGC-25 and AN/FGC-25X.*

| FSN | QTY | Nomemclature, part No., and mfr code | Weight (lbs) | Dimensions (in.) | | | Usable on code |
|---|---|---|---|---|---|---|---|
| | | | | Height | Width | Depth | |
| | | NOTE<br>The part number is followed by the applicable 5-digit Federal supply code for manufacturers (FSCM) identified in SB 708-42 and used to identify manufacturer, distributor, or Government agency, etc. | | | | | |
| | | Teletypewriter Set AN/FGC-25 | | | | | |
| | | Teletypewriter Set AN/FGC-25X | | | | | |
| | | Consisting of: | | | | | |
| | | NOTE<br>In the usable on code number 1 refers to the AN/FGC-25 and number 2 refers to the AN/FGC-25X. | | | | | |
| 5815-339-1515 | 1 | Copy holder teletypewriter: SM-B-187480; 80063 | | | | | 1, 2 |
| 5310-044-5107 | 4 | Nut, sheet spring: MIL-N-3537, type I; 81349 | | | | | 1, 2 |
| 5815-503-2769 | 1 | Reperforator-Transmitter, Teletypewriter TT-179/FG, TT-179A/FG | 58 | 11¼ | 17-1/8 | 20-9/16 | 1 |
| 5815-543-1327 | 1 | Reperforator-Transmitter, Teletypewriter TT-178/FG, TT-178A/FG | 58 | 11¼ | 17-1/8 | 20-9/16 | 2 |
| | | Consisting of: | | | | | |
| | | NOTE<br>In the usable on code, number 3 refers to the TT-178/FG; number 4 refers to the TT-178A/FG; number 5 refers to the TT-179/FG; and number 6 refers to the TT-179A/FG. | | | | | |
| 5815-523-8663 | 1 | Gear, Compound, Spur: 60-75 wpm; SM-B-187378-2; 80063 | | | | | 3, 5 |
| 5815-623-3312 | 1 | Gear, Compound, Spur: 60-75 wpm; SM-B-321374; 80063 | | | | | 4, 6 |
| 5815-323-7291 | 1 | Gear, Compound, Spur: 75-100 wpm; SM-B-187378-1; 80063 | | | | | 3, 5 |
| 5815-626-1916 | 1 | Gear, Compound, Spur: 75-100 wpm; SM-B-321342; 80063 | | | | | 4, 6 |
| 5815-203-1678 | 1 | Gear, Worm: 60 wpm; SC-B-069681; 80063 | | | | | 3, 4, 5, 6 |
| 5815-203-1327 | 1 | Gear, Worm: 100 wpm; SC-B-070482; 80063 | | | | | 3, 4, 5, 6 |
| 5815-534-3016 | 1 | Gear, Worm: 75 wpm; SM-B-187568; 80063 | | | | | 3, 4, 5, 6 |
| 5815-378-5593 | 1 | Gear, Worm Wheel: 60 wpm; SC-B-070492; 80063 | | | | | 3, 4, 5, 6 |

| FSN | QTY | Nomenclature, part No., and mfr code | Weight (lbs) | Dimensions (in.) | | | Usable on code |
|---|---|---|---|---|---|---|---|
| | | | | Height | Width | Depth | |
| 5815-534-3015 | 1 | Gear, Worm Wheel: 75 wpm; SM-B-187567; 80063 | | | | | 3, 4, 5, 6 |
| 5815-351-7944 | 1 | Gear, Worm Wheel: 100 wpm; SC-B-070478; 80063 | | | | | 3, 4, 5, 6 |
| 7510-511-6690 | 2 | Ribbon, Teletypewriter: DDD-R-311d; type 1, class 1, cotton, Garde A, heavy inking; 81348 (1 of 2 is a running spare) | | | | | 3, 4, 5, 6 |
| 5815-356-3227 | 1 | Spool, Ribbon, Teletypewriter: No. 1; 22268 | | | | | 3, 4, 5, 6 |
| 7530-634-6237 | 5 | Tape, Teletypewriter, Perforator: UU-T-120; 81348 (4 of 5 are running spares) | | | | | 3, 4, 5, 6 |
| 5305-550-4593 | 4 | Screw, Cap, Socket Head: MS-35459-40; 81349 | | | | | 1, 2 |
| 5305-550-4594 | 4 | Screw, Cap, Socket Head: MS-35459-41; 81349 | | | | | 1, 2 |
| 5305-141-2784 | 4 | Screw, Machine: 10309; 82423 | | | | | 1, 2 |
| 5305-545-8377 | 4 | Screw, Machine: 10153 82423 | | | | | 1, 2 |
| 5305-619-2488 | 4 | Setscrew: 56534; 82423 | | | | | 1, 2 |
| 5815-503-2624 | 1 | Table, Teletypewriter FN-65/FG<br>Consisting of: | 52 | 27 | 23½ | 40 | 1, 2 |
| 5815-342-6048 | 1 | Basket, Teletypewriter: SM-B-187539; 80063 | | | | | |
| 5815-610-7814 | 1 | Guide, Tape Storage: SM-C-187680; 80063 | | | | | |
| 5815-610-7515 | 1 | Guide, Tape Storage: SM-B-187544; 80063 | | | | | |
| 5815-701-5026 | 1 | Chute, Tape, Teletypewriter: SM-B-187551; 80063 | | | | | |
| 5815-657-9958 | 1 | Retainer, Tape Basket: SM-B-187542; 80063 | | | | | |
| 5815-521-1402 | 1 | Teletypewriter TT-117/FG, TT-117A/FG, TT-117B/FG | 79 | 13-3/32 | 17-1/8 | 22-3/16 | 1 |
| 5815-539-7773 | 1 | Teletypewriter TT-119/FG, TT-119A/FG, TT-119B/FG<br>Consisting of: | 79 | 13-3/32 | 17-1/8 | 22-3/16 | 2 |
| | | NOTE<br>The following components apply to both the TT-117/FG, TT-117A/FG, TT-117B/FG and the 119/FG, 119A/FG 119B/FG. | | | | | |
| 5815-663-3066 | 1 | Crank, Hand: SM-B-187005; 80063 | | | | | |
| 5815-203-1678 | 1 | Gear, Worm: 60 wpm; SC-B-069681 | | | | | |
| 5815-534-3016 | 1 | Gear, Worm: 75 wpm; SM-B-187568; 80063 | | | | | |
| 5815-203-1327 | 1 | Gear, Worm: 100 wpm; SC-B-070482; 80063 | | | | | |
| 5815-378-5593 | 1 | Gear, Worm Wheel: 60 wpm; SC-B-07092; 80063 | | | | | |
| 5915-534-3015 | 1 | Gear, Worm Wheel: 75 wpm; SM-B-187567; 80063 | | | | | |
| 5815-351-7944 | 1 | Gear, Worm Wheel: 100 wpm; SC-B-070478; 80063 | | | | | |
| 7530-281-2694 | 2 | Paper, Recording: UU-P-547, type 1, class 1, Grade A; 81348 (1 of 2 is a running spare) | | | | | |

| FSN | QTY | Nomenclature, part No. and mfr code | Weight (lbs) | Dimensions (in.) | | | Usable on code |
|---|---|---|---|---|---|---|---|
| | | | | Height | Width | Depth | |
| 7510-511-6690 | 1 | Ribbon Teletypewriter: DDD-R-331d, type 1, class 1, cotton, Grade A, heavy inking; 81348 (1 of 2 is a running spare) | | | | | |
| 5815-356-3371 | 1 | Shaft, Paper Roll: SC-B-070404; 80063 | | | | | |
| 5815-356-3227 | 1 | Spool, Ribbon, Teletypewriter: No. 1; 22268 | | | | | |
| 5310-013-1121 | 8 | Washer, Lock: MS-35339-63; 81349 | | | | | 1, 2 |

*b. Teletypewriter Sets AN/FGC-26, AN/FGC-57, AN/FGC-161, and AN/FGC-162.*

| Quantity | Equipmments | | | | Dimensions (in.) | | | Volume (cu ft) | Net Weight (lbs) |
|---|---|---|---|---|---|---|---|---|---|
| | AN/FGC-26 | AN/FGC-57 | AN/FGC-161 | AN/FGC-162 | Height | Width | Depth | | |
| 1 | TT-118/FG | TT-117A/FG | TT-666/FG<br>or<br>TT-666A/FG<br>or<br>TT-666B/FG | TT-668/FG<br>or<br>TT-668A/FG<br>or<br>TT-668B/FG | 13-3/32 | 17-1/8 | 22-3/16 | 2.9 | 79 |
| 1 | TT-181/FG | TT-250/FG | TT-667/FG<br>or<br>TT-667A/FG<br>or<br>TT-666B/FG | TT-669/FG<br>or<br>TT-669A/FG | 11-1/4 | 17-1/8 | 20-9/16 | 2.3 | 58 |
| 1 | FN-65/FG | FN-111/FG | FN-65/FG | FN-65/FG<br>TD-Control Box | 27 | 23-1/2 | 40 | 14.7 | 52 |
| 1 | Running spares. | Running spares. | Running spares. | Running spares. | | | | | 12.5 |

## 1-10. Expendable Consumable Supplies and Materials
(fig. 12)

Expendable consumable supplies and materials are listed in table 1-1.

*Table 1-1. Expendable Consumble Supplies and Materials*

The supplies and materials listed in this table are required for operation of this equipment and are authorized to be requisitioned by SB 700-50. The FSN for the applicable unit of issue required can be found in appropriate supply catalogs. The FSCM is used as an element in item identification to designate manufacturer or distributor or Government agency, etc., and is identified in SB 708-42.

| *Item* | *Description* | *Ref No. and FSCM* | *FSC* |
|---|---|---|---|
| 1 | Paper, Recording | UU-P-547; type 1, class 1, Grade A; 81348. | 7530 |
| 2 | Ribbon, Teletypewriter: cotton; heavy inking. | DDD-R-311d, type 1, class 1; 81348. | 7510 |
| 3 | Tape, Teletypewriter, Perforator | UU-T-120; 81348. | 7530 |

## 1-11. Running Spares
(fig. 1-2)

| *Quality* | *Item* |
|---|---|
| 2 | Lamp, 6.3-volt |
| 1 | Lamp, 115-volt |
| 2 | Lamp, 120-volt. |
| 1 | Fuse, 1.6-ampere, 125-volt. |
| 1 | Fuse, ¾-ampere, 125-volt. |
| 1 | Fuse, ½-ampere, 250-volt. |
| 1 | Fuse, 1/16-ampere, 250-volt. |
| 2 | Fuse, 4-ampere, 250-volt. |

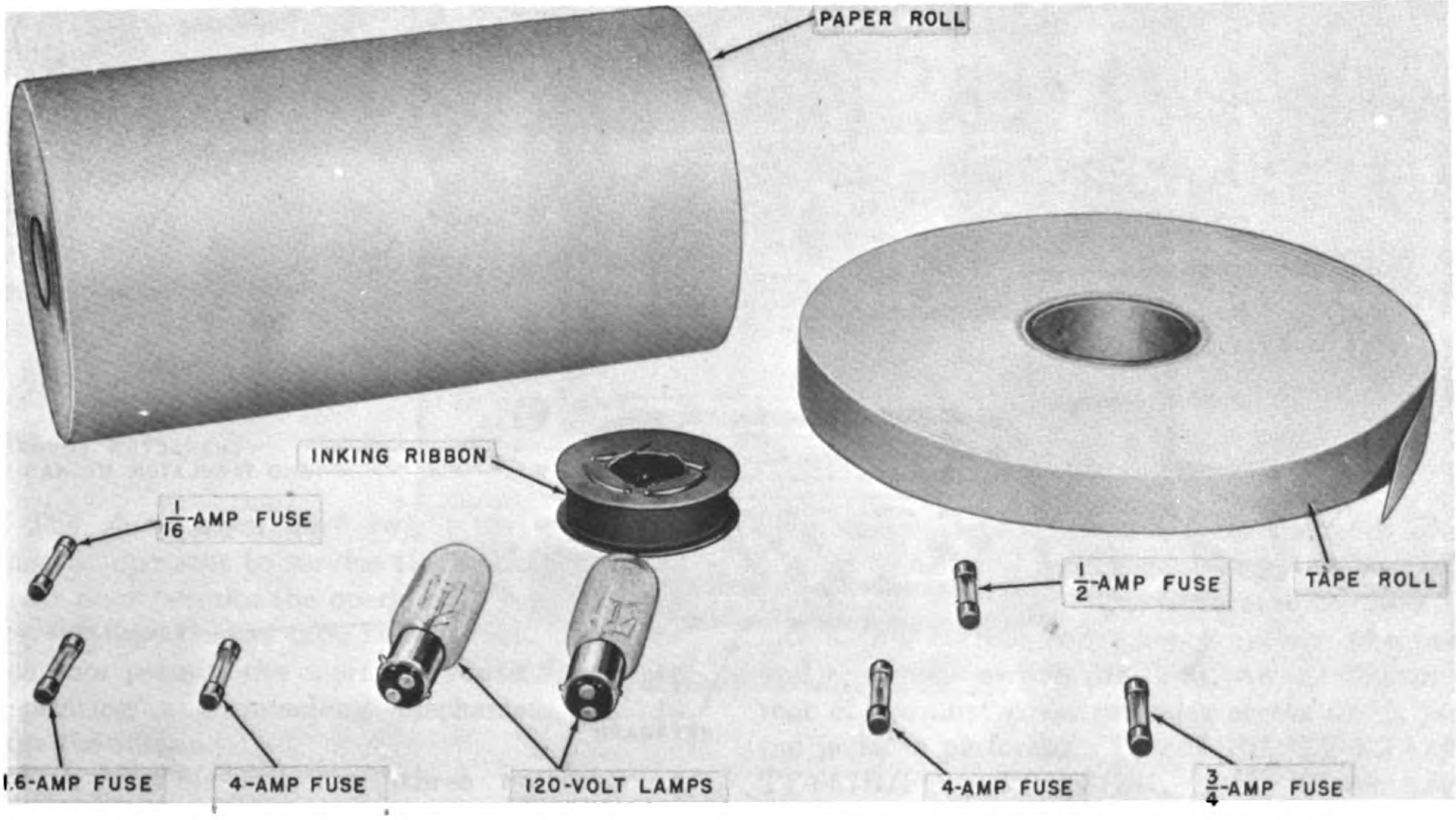

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*Figure 1-2. Running spares.*

### 1-12. Common Names

Common names have been assigned to the items listed below:

| *Nomenclature* | *Common name* |
|---|---|
| Teletypewriter Sets AN/FGC-25, AN/FGC-25X, AN/FGC-26, AN/FGC-26X, AN/FGC-52, AN/FGC-52X, AN/FGC-57, AN/FGC-68, AN/FGC-161, and AN/FGC-162. | Teletypewriter sets |
| Teletypewriters TT-117/FG, TT-117A/FG, TT-117B/FG, TT-118/FG, TT-119/FG, TT-119A/FG, TT-119B/FG, TT-120/FG, TT-269FG, TT-269A/FG, TT-271/FG, TT-271A/FG, TT-396/FG, TT-666/FG, TT-666A/FG, TT-666B/FG, TT-668/FG, TT-668A/FG, and TT-668B/FG. | Page printer |
| Reperforator-transmitters TT-178/FG, TT-178A/FG, TT-178B/FG, TT-179/FG, TT-179A/FG, TT-179B/FG, TT-180/FG, TT-181/FG, TT-250/FG, TT-270/FG, TT-272/FG, TT-397/FG, TT-667/FG, TT-667A/FG, TT-667B/FG, TT-669/FG, and TT-669A/FG. | Perforator |
| Table, Teletypewriter TT-65/FG. | Table |
| Transmitter-distributor control box | TD control box |

### 1-13. Description of Teletypewriter Set

The teletypewriter set (fig. 1-1) consists of a page printer, a perforator, and a table. The page printer is placed at the left on the table and the perforator is placed at the right.

### 1-14. Description of Page Printer
(fig. 1-3)

*a.* The page printer includes a keyboard-transmitter and a page-printing mechanism. The keyboard portion of the keyboard-transmitter is in front of and below the dust cover. A character counter and a tabulator mechanism are located toward the rear of the keyboard. Four switch controls are mounted in the keyboard guard; two on each side. The end-of-line lamp is located on the right side of the keyboard guard. The page-printing mechanism is completely housed beneath the dust cover.

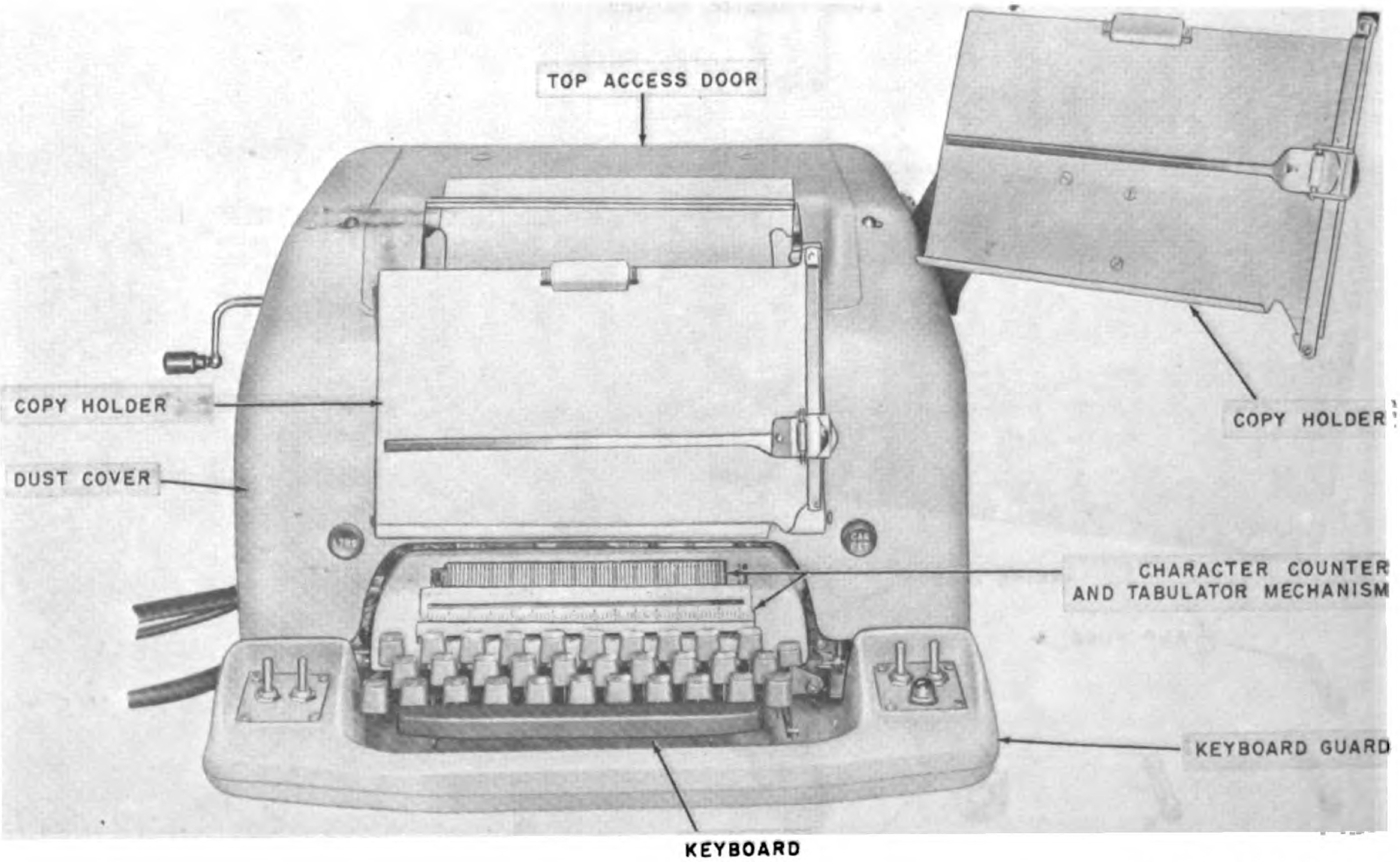

*Figure 1-3. Page printer.*

*b.* The page printer dust cover has an access opening at the top. The rear portion of the opening is covered by a door; the front portion, by a window. This opening provides easy access for changing ribbons, replenishing paper, or operating interior controls. A small access door on the left side of the dust cover allows maintenance personnel to adjust the rangefinder without removing the entire cover.

*c.* A copyholder mounted at the front of the dust cover holds the message copy at an appropriate level in the operator's line of vision. A second copyholder is provided for mounting to the right side of the dust cover.

### 1-15. Description of Perforator
(fig. 1-4)

*a.* The perforator includes a tape receiver, a power supply, and a transmitter-distributor. The tape receiver and the power supply are completely housed beneath the perforator dust cover. The transmitter-distributor is mounted at the left side of the unit and has its own dust cover. The TT-270/FG, TT-272/FG, TT-397/FG, and TT-669/FG include a transmitter-distributor control box which is mounted on the table at the rear of the transmitter-distributor.

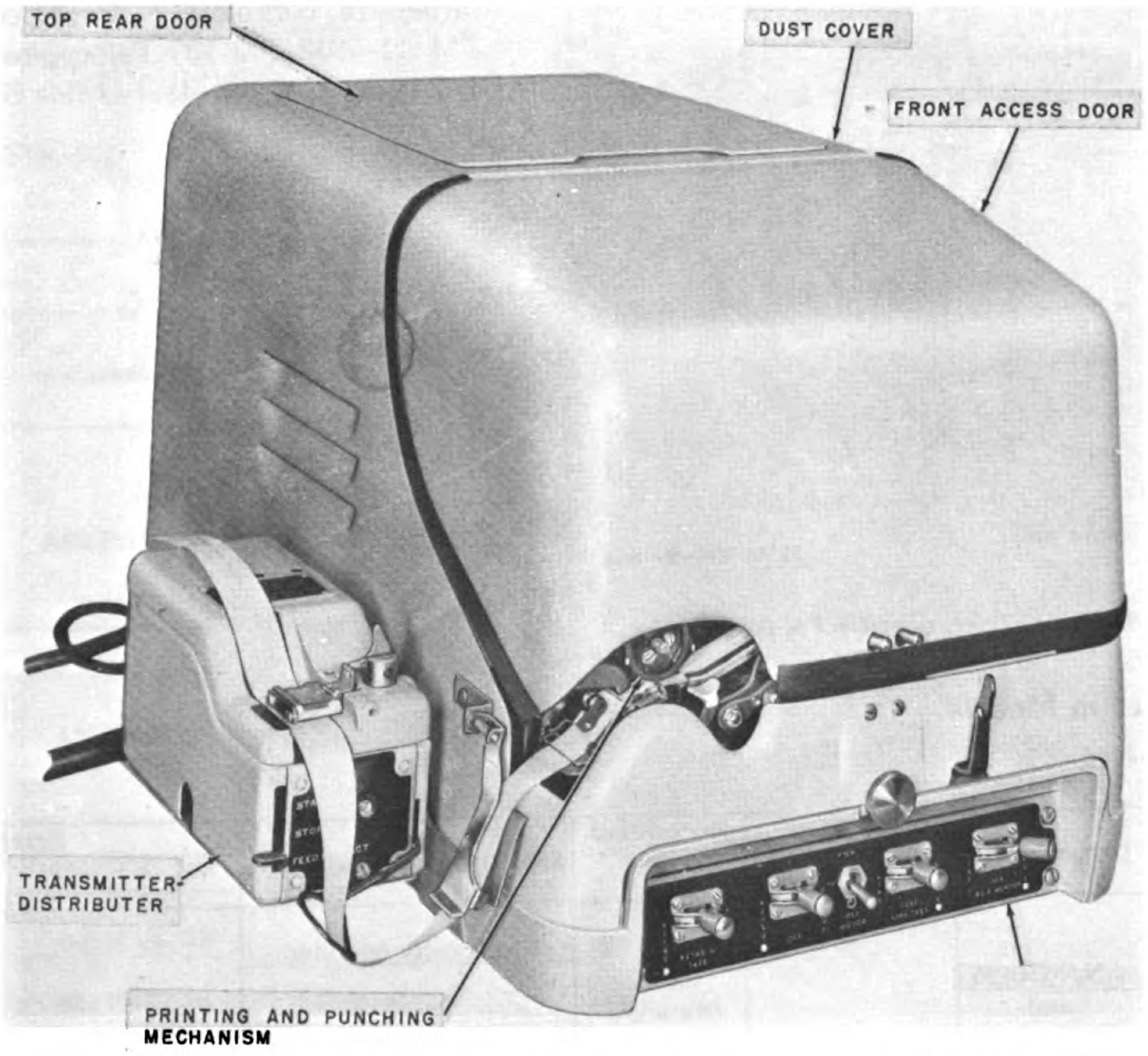

*Figure 1-4. Perforator.*

*b.* The dust cover has two access doors to enable the operator to service the mechanism. The top rear door permits the operator to replenish the supply of tape on the tape supply reel. The front access door permits the operator to insert tape into the printing and punching mechanism and to change the ribbon.

*c.* Five control switches (three switches on perforators TT-667/FG, TT-667A/FG, TT-667B/FG, TT-669/FG, and TT-669A/FG) are located on a switch plate on the lower front face of the equipment. The manual tape feed-out lever is located directly above the switch plate (fig. 3-9). Two control levers protrude from the front of the transmitter-distributor (fig. 3-8). Another panel located at the rear of the perforator contains two alternating current convenience outlets, two fuses, and the power switch (fig. 2-8). An opening in the rear of the dust cover provides access to six jacks (no jacks in perforators TT-667/FG, TT-667A/FG, TT-667B/FG, TT-669/FG, and TT-669A/FG) installed within the perforators TT-270/FG, TT-272/FG, TT-397/FG, and TT-669/FG have two additional switches mounted on the transmitter-distributor control box.

## 1-16. Description of Table, Teletypewriter FN-65/FG.

(fig. 1-5)

*a.* The table is used to support the page printer and the perforator at a height convenient for a seated operator. Openings are cut into the table top and guides are installed to guide the received tapes into storage and to guide the spent tape and chad into the proper container in the table compartment.

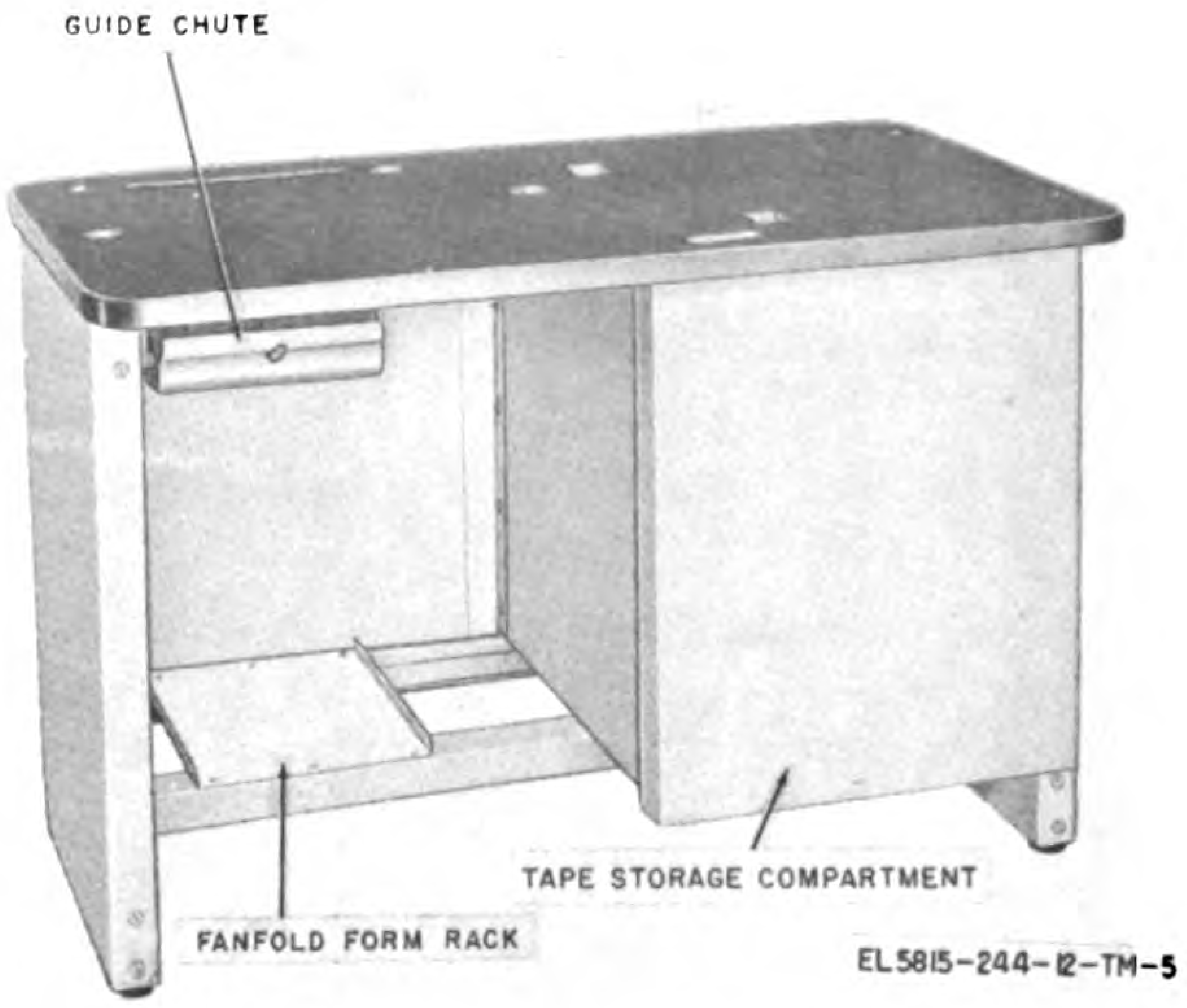

*Figure 1-5. Table, Teletypewriter FN-65/FG.*

*b.* A hollow sliding door at the right side of the table serves as a tape storage area and provides access to the compartment which houses the spent tape and chad bin.

## 1-17. Description of Table, Teletypewriter FN-111/FG

The FN-111/FG, used with Teletypewriter Set AN/FGC-57 (part of Teletypewriter Central Office Set AN/FGC-30), is similar to FN-65/FG except that additional mounting holes are provided in the table to mount the additional components required with the AN/FGC-30. The unique features of this table are completely described and illustrated in TM 11-5815-203-15, Teletypewriter Components of Teletypewriter Central Office Set AN/FGC-30.

## 1-18. Differences in Models.

*a. Page Printers.*

| Type No. | Component of | Motor type | Keyboard and typebar symbols | Keyboard lockout mechanism | Signaling code | |
|---|---|---|---|---|---|---|
| | | | | | Send | Receive |
| TT-117/FG | AN/FGC-25 and AN/FGC-57 | Synchronous | Standard | Electrically operated | 7.42 units | 7.00, 7.42, and 8.00 units |
| TT-117A/FG | | | | Manually operated | | |
| TT-117B/FG | | | | | | |
| TT-117C/FG | | | | | | |
| TT-118/FG | AN/FGC-26 | | Weather | | | |
| TT-118A/FG | | | | | | |
| TT-119/FG | AN/FGC-25X | Series-governed | Standard | Electrically operated | | |
| TT-119A/FG | | | | Manually operated | | |
| TT-119B/FG | | | | | | |
| TT-119C/FG | | | | | | |
| TT-120/FG | AN/FGC-26X | | Weather | | | |
| TT-269/FG | AN/FGC-52 and AN/UGC-30 | Synchronous | Standard | | | |
| TT-269A/FG | | | | | | |
| TT-269B/FG | | | | | | |

| Type No. | Component of | Motor type | Keyboard and typebar symbols | Keyboacd lockout mechanism | Signaling code | |
|---|---|---|---|---|---|---|
| | | | | | Send | Receive |
| TT-271/FG | AN/FGC-52X and AN/UGC-30X | Series-governed | | | 8.00 units | 7.00, 7.42 and 8.00 units |
| TT-271A/FG | | | | | | |
| TT-271B/FG | | | | | | |
| TT-396/FG | AN/FGC-68 | Synchronous | Weather | | | |
| TT-666/FG | AN/ᴾGC-161 | Synchronous | Standard | Electrically operated | 7.42 units | |
| TT-666A/FG | | | | Manually operated | | |
| TT-666B/FG | | | | | | |
| TT-668/FG | AN/FGC-162 | | | | 8.00 units | |
| TT-668A/FG | | | | | | |
| TT-668B/FG | | | | | | |

*b. Perforators.*

| Type No. | Component of | Motor type | Typewheel symbols | Signaling code | |
|---|---|---|---|---|---|
| | | | | Send | Receive |
| TT-178/FG | AN/FGC-25X | Series-governed | Standard | 7.42 units | 7.00, 7.42, and 8.00 units |
| TT-178A/FG | | | | | |
| TT-178B/FG | | | | | |
| TT-179/FG | AN/FGC-25 | Synchronous | | | |
| TT-179A/FG | | | | | |
| TT-179B/FG | | | | | |
| TT-180/FG | AN/FGC-26X | Series-governed | Weather | | |
| TT-181/FG | AN/FGC-26 | Synchronous | | | |
| TT-250/FG | AN/FGC-57 | | Standard | | |
| TT-270/FG [a] | AN/FGC-52 and AN/UGC-30 | | | 7.00 units | |
| TT-270A/FG [a] | | | | | |
| TT-272/FG [a] | AN/FGC-52X and AN/UGC-30X | Series-governed | | | |
| TT-272A/FG [a] | | | | | |
| TT-397/FG [a] | AN/FGC-68 | Synchronous | Weather | | |
| TT-667/FG | AN/FGC-161 | Synchronous | Standard | 7.42 units | 7.00, 7.42 and 8.00 units |
| TT-667A/FG | | | | | |
| TT-667B/FG | | | | | |
| TT-669/FG | AN/FGC-162 | | | 7.00 units | |
| TT-669A/FG | | | | | |

[a] Furnished with a transmitter-distributor control box that permits an external control of the transmitter-distributor clutch magnet.

### 1-19. System Applications (Except AN/FGC-161 and AN/FGC-162)

*a.* The teletypewriter set may be used on either a half-duplex or a full-duplex basis over direct current (dc) wire lines (fig. 1-6) or in carrier (A, fig. 1-7) or radio systems (B, fig. 1-7). It is equipped with a power supply which provides for adjustment of the ac voltage and also supplies the dc voltage necessary for the local control circuits and the signal line current.

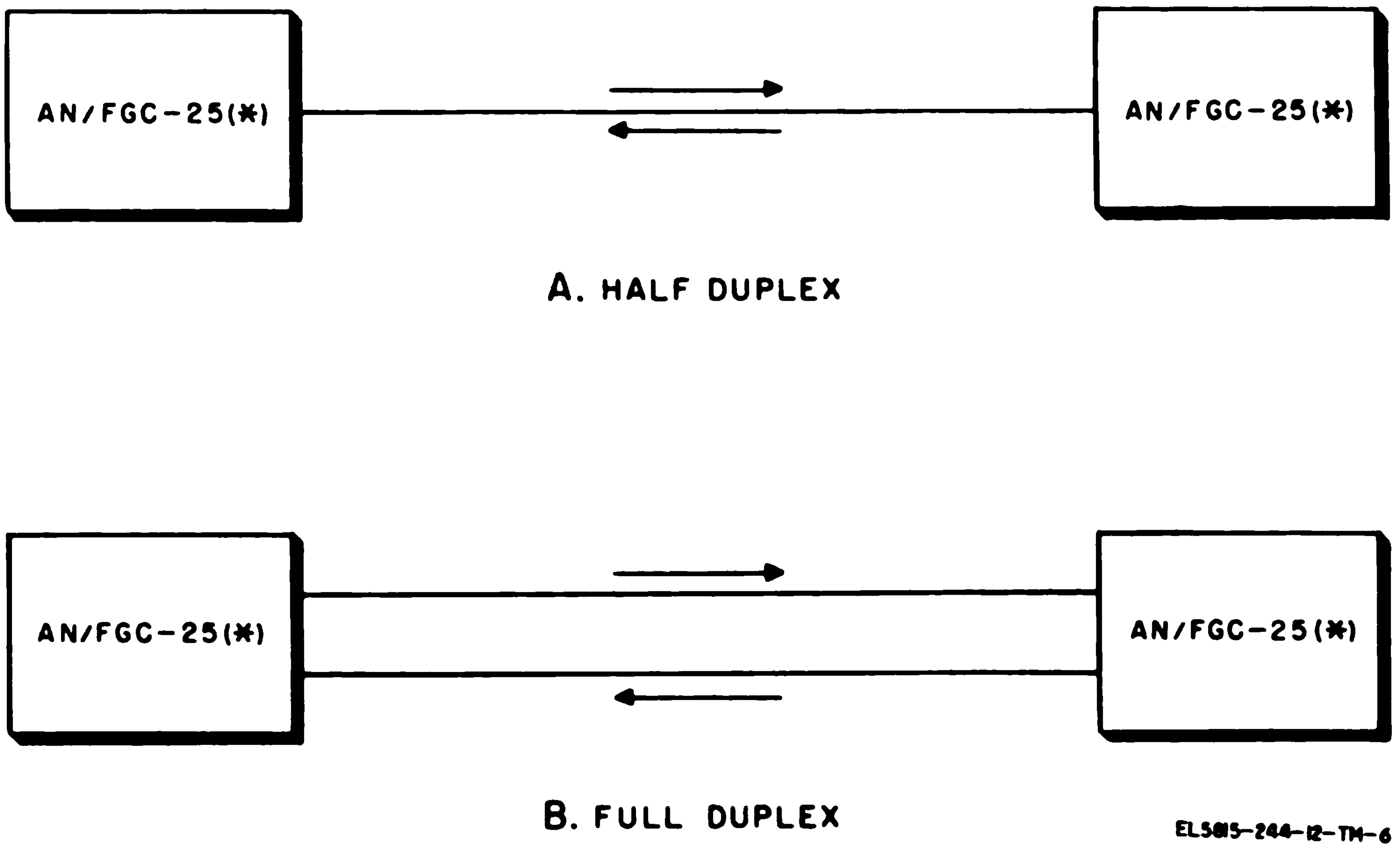

*Figure 1-6. Dc wire systems, block diagrams.*

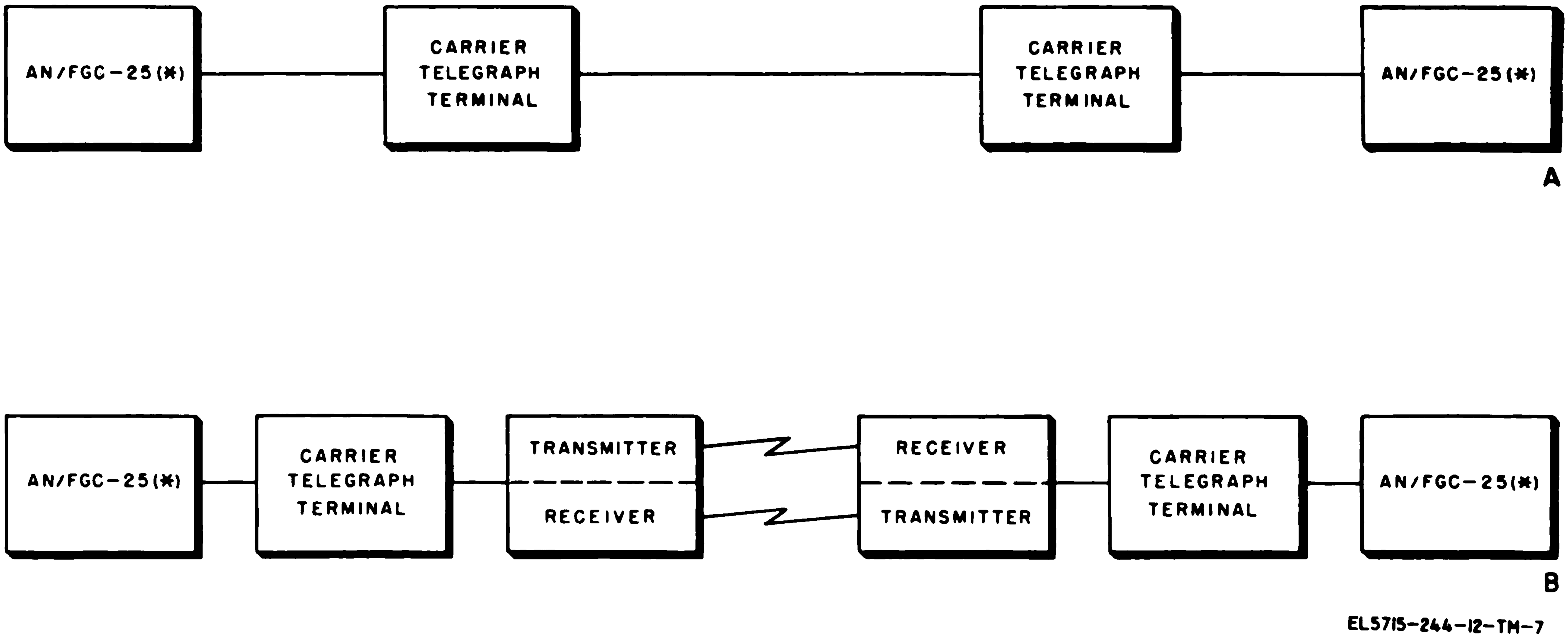

*Figure 1-7. Carrier or radio system, block diagrams.*

*b.* Typical uses for the teletypewriter set are shown in figure 1-8. Other combinations can be used as desired. In the examples given, either of the transmitters may be used individually to transmit to the signal line (A and B, fig. 1-8). Either of the receivers may be used to receive directly from the signal line (C and D, fig. 1-8). The page-printing mechanism may be used locally to provide page copy from message tape fed into the transmitter-distributor (E, fig. 1-8) or it may be used as a monitor of messages sent to the signal line from the transmitter-distributor (G, fig. 1-8). Tape may be prepared locally for later transmission to the signal line by placing the keyboard-transmitter in series with the tape receiver (F, fig. 1-8). For operation on two separate signal lines (H, fig. 1-8) the page-printing mechanism and the keyboard-transmitter may be used together on one signal line and the tape receiver and the transmitter-distributor may be used on the other.

### 1-20. System Applications (AN/FGC-161 and AN/FGC-162)

*a.* These teletypewriter sets are used for low level polar signaling operation on a full-duplex basis over direct lines (B, fig. 1-6), in carrier (A, fig. 1-7), or radio systems (B, fig. 1-7). Half-duplex operation, wherein a single line is used for both send and receive, cannot be used.

*b.* The power supply provides for adjustment of the ac voltage and also supplies the dc voltage necessary for the low level conversion circuits and the local control circuits.

*c.* Typical uses for the teletypewriter sets are shown in figure 1-8 and described in paragraph 1-19.

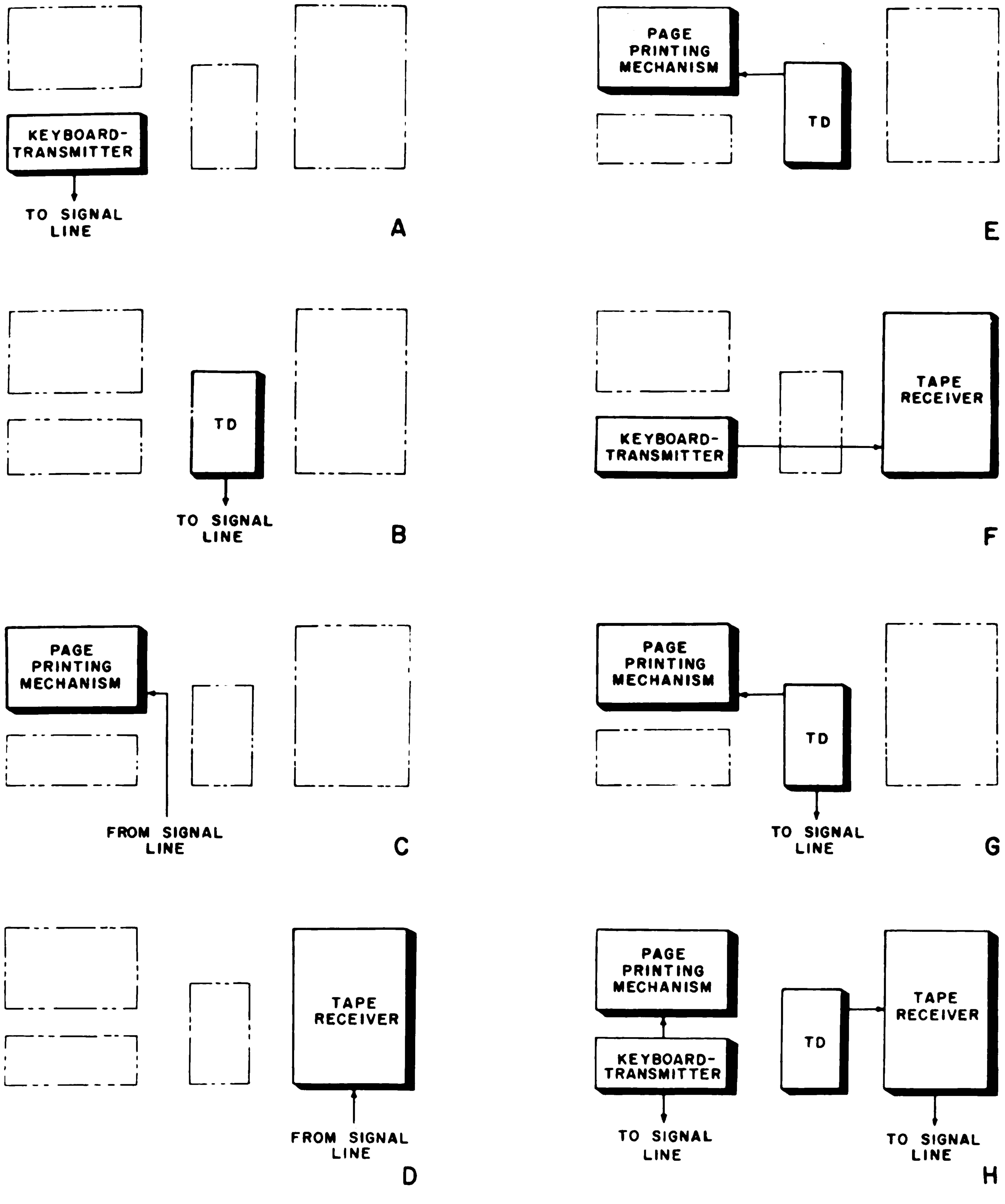

*Figure 1-8. Uses of teletypewriter set, block diagram.*

# CHAPTER 2

# INSTALLATION

## Section I. SERVICE UPON RECEIPT OF EQUIPMENT

### 2-1. Siting

The selection of a suitable location requires that consideration by given to the accessibility of equipment for maintenance, convenience of operating personnel, illumination needs, and the flow of message traffic in the communications center. Whenever possible, sufficient room should be allowed at the rear of the equipment to permit free access for maintenance personnel. A minimum of 3 feet of clearance should be provided at the front of the equipment for the operator. Power outlets within the range of 95- to 250-volts alternating current (ac) are essential: AN/FGC-25, AN/FGC-26, AN/FGC-52, AN/FGC-57, AN/FGC-68, and AN/UGC-30 require a regulated 60-Hz source, AN/FGC-25X, AN/FGC-26X, AN/FGC-52X, and AN/UGC-30X require 50- to 60-Hz regulated or unregulated source.

### 2-2. Unpacking

*a. Packaging Data.* Each teletypewriter set is packed for shipment as follows:

| Box No. | Unit | Height (in.) | Width (in.) | Depth (in.) | Volume (cu ft) | Unit weight (lb) |
|---|---|---|---|---|---|---|
| 1 | Page printer | 18¾ | 24¾ | 29 | 7.8 | 88 |
| 2 | Perforator | 20¼ | 26 | 32½ | 10.2 | 110 |
| 3 | Table and accessories. | 29-3/8 | 25-3/8 | 43½ | 18.8 | 109 |

(1) The page printer (fig. 2-1) and perforator (fig. 2-2) are each mounted on a separate shipping baseboard. Shock mounts are installed between the equipments and the baseboards. A heat-sealed waterproof barrier incloses each component which is then placed in a nailed wooden box.

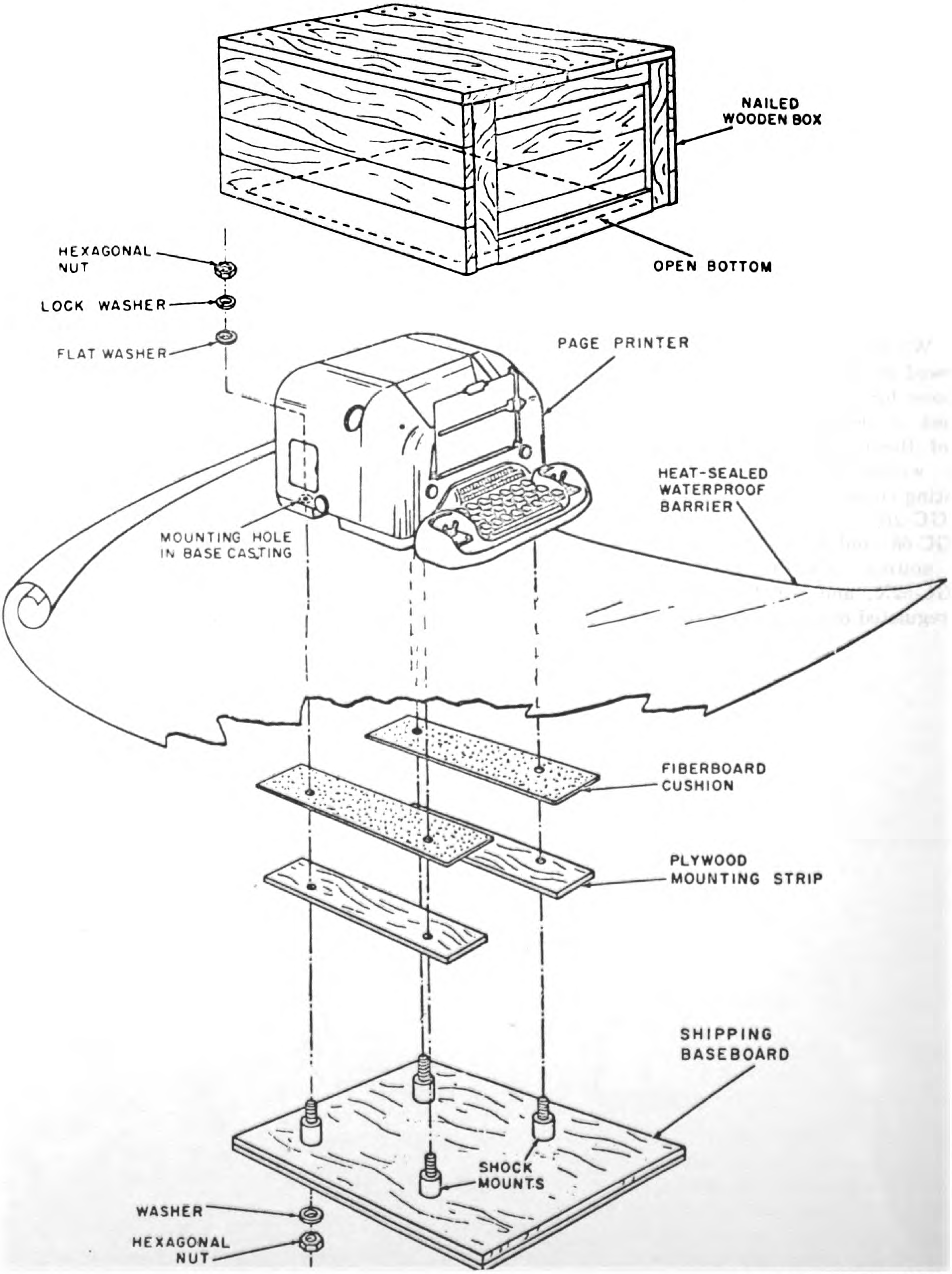

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*Figure 2-1. Page Printer packaged for domestic or export shipment.*

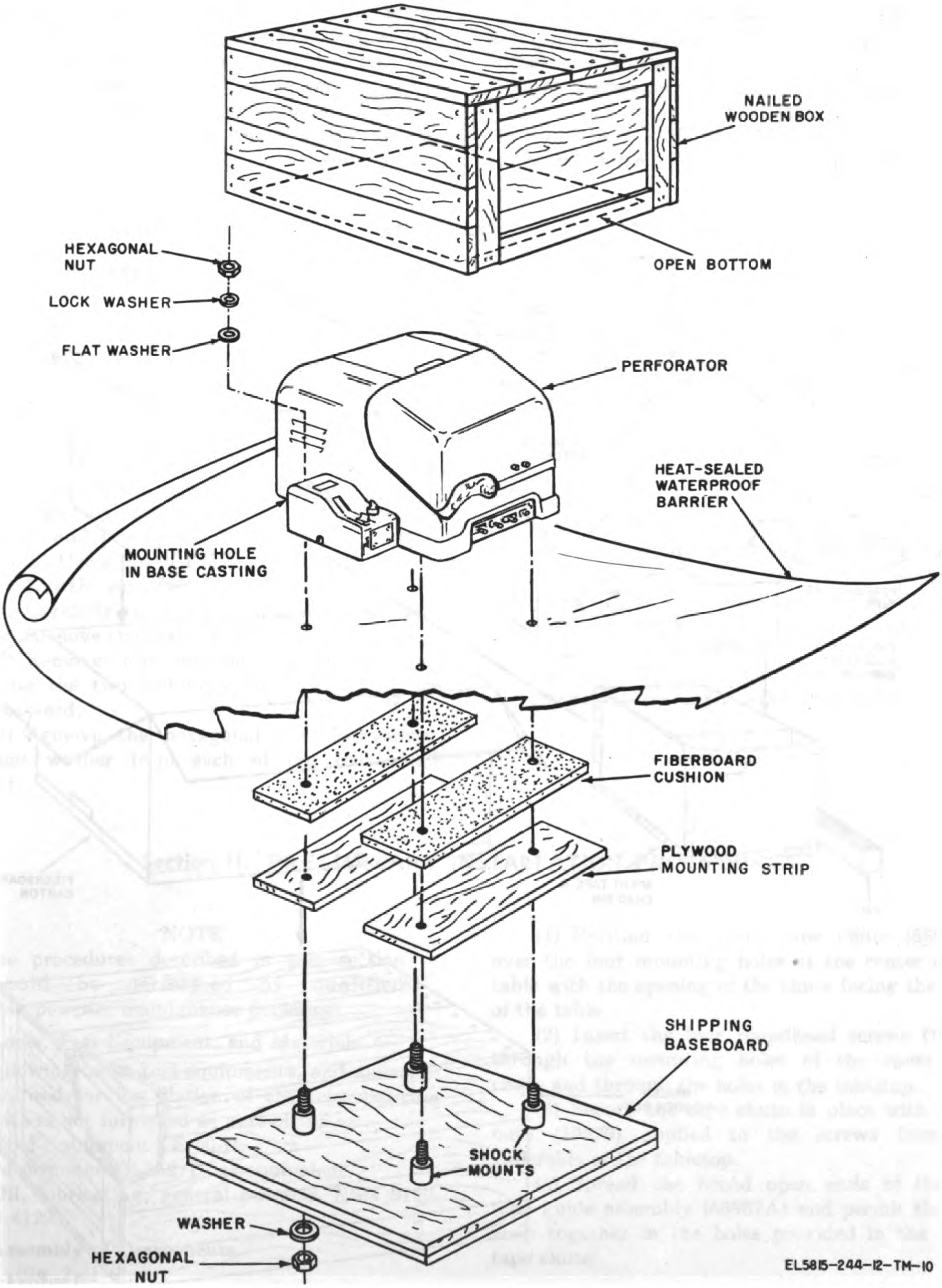


*Figure 2-2. Perforator packaged for domestic or export shipment.*

(2) The table and accessory package (fig. 2-3) has a separate carton which contains a spent tape chute, copyholder, TD tape guide, and tape storage guide. This carton is packed in a second carton along with the paper rolls, perforator tape, inking ribbon, technical manuals, and control box for AN/FGC-52, AN/FGC-52X, AN/FGC-68, AN/UGC-30 and AN/UGC-30X. After this carton is sealed with gummed tape, it is placed inside the spent tape and chad bin. The spent tape and chad bin is positioned in its normal place in the table, and the table door is closed. Filler strips are placed on both ends of the table top, and the entire unit is placed in a corrugated carton, which then is sealed with gummed tape and placed in a nailed wooden box.

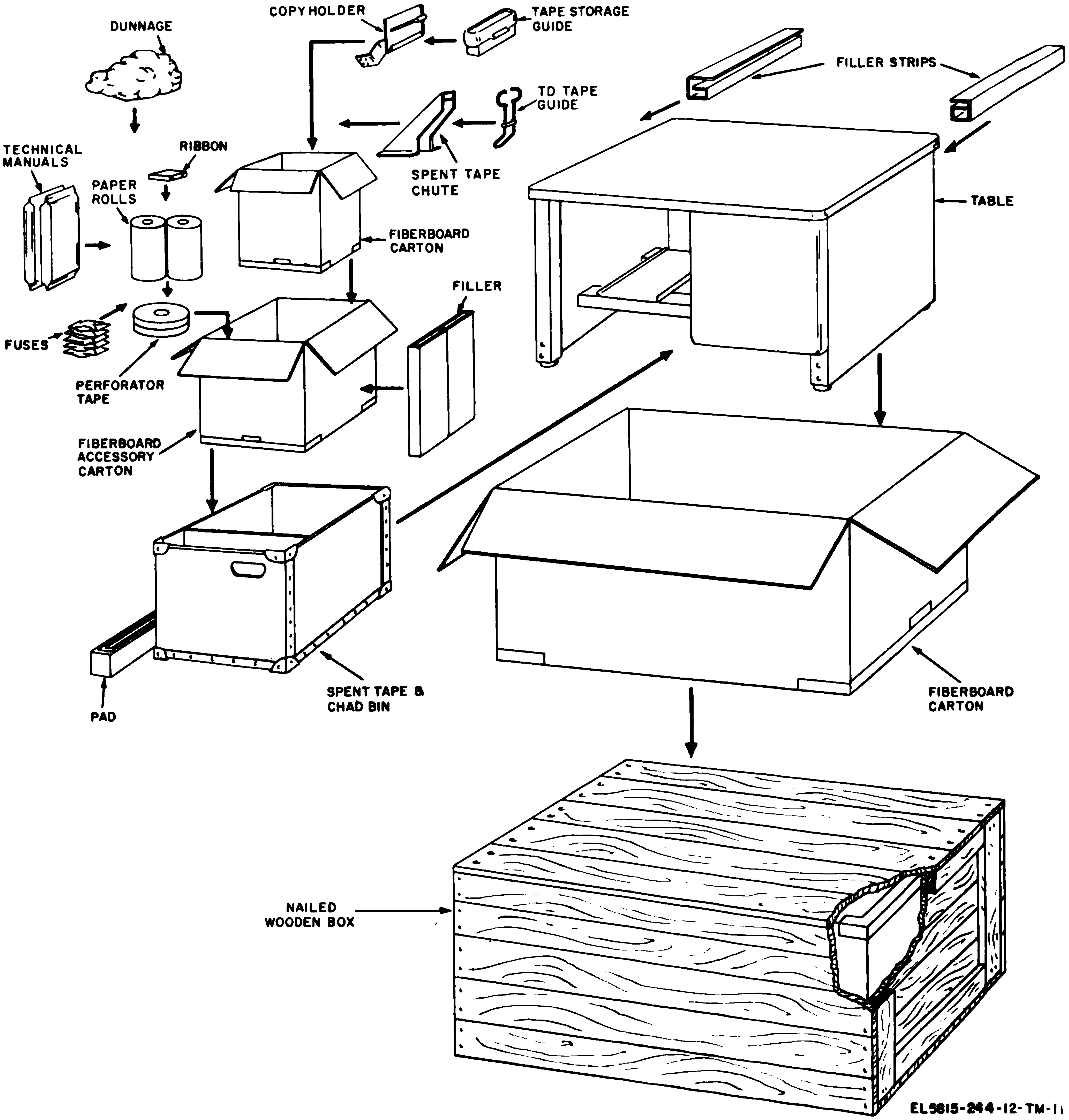


Figure 2-3. Table and accessories packed for domestic or export shipment.

*b. Unpacking Table.* (fig. 2-3)

(1) Remove the nails from the wooden box and remove the cover. Use a nail puller. (Not applicable on Order No. 23330-PC-60-C5-51 and Order No. 35997-PC-62-C5-51.)

(2) Remove the fiberboard carton from the wooden box. (Not applicable on Order No. 23330-PC-60-C5-51 and Order No. 35997-PC-62-C5-51.)

(3) Open the carton by slitting three of the corner edges to permit the fourth edge to act as a hinge and remove the table.

(4) Remove the accessory package.

*c. Unpacking Page Printer or Perforator* (fig. 2-1 and 2-2)

CAUTION

Be careful when unpacking equipment. Do not thrust tools into the interior of the shipping containers; this procedure may damage the equipment.

(1) Remove all but one or two nails along opposite edges of the shipping baseboard.

(2) Carefully set the box on its shipping baseboard and pry up the box from the shipping baseboard. Use a heavy wedge or crowbar.

(3) Lift the wooden box straight up.

(4) Carefully cut around the base of the sealed barrier. Remove the sealed barrier.

(5) Remove the equipment dust cover by loosening the two locking knobs and lifting the cover upward.

(6) Remove the hexagonal nut, lockwasher, and flat washer from each of the four shock mounts.

(7) Remove the platen crank and the power cord from the paper spindle above the power supply when unpacking the page printer. Replace the dust cover and tighten the locking knobs.

(8) Lift the unit from the shock mounts.

**2-3. Checking Unpacked Equipment**

*a.* Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on DD Form 6 (para 1-3).

*b.* See that the equipment is complete as listed on the packing slip. If a packing slip is not available, check the equipment against the information noted in paragraph 1-9. Report all discrepancies in accordance with TM 38-750. Shortage of a minor assembly or a part that does not affect proper functioning of the equipment should not prevent use of the equipment.

*c.* If the equipment has been used or reconditioned, see whether it has been changed by a modification work order (MWO). If the equipment has been modified, the MWO number will appear near the nomenclature plate. Check to see whether the MWO number (if any) and appropriate notations conserning the modifications have been entered in the equipment manual.

NOTE

Current MOW's applicable to the equipment are listed in DA Pam 310-7.

## Section II. PRELIMINARY INSTALLATION PROCEDURES

NOTE

The procedures described in this section should be performed by qualified teletypewriter maintenance personnel.

**2-4. Tools, Test Equipment, and Materials.**

The following tools, test equipments, and materials are required for installation of the teletypewriter set, but are not furnished as part of the set.

*a.* Tool Equipment TE-50-B.

*b.* Multimeter TS-352/U, or equivalent.

*c.* Oil, lubricating, general purpose, NSN 9150-00-223-4129.

**2-5. Assembly of Components.**
(fig. 2-4)

*a. Tape Chute.*

(1) Position the spent tape chute (56982A) over the four mounting holes at the center of the table with the opening of the chute facing the front of the table.

(2) Insert the four roundhead screws (10153) through the mounting holes of the spent tape chute and through the holes in the tabletop.

(3) Secure the tape chute in place with speed nuts (10579) applied to the screws from the underside of the tabletop.

(4) Spread the broad open ends of the TD tape guide assembly (56967A) and permit them to snap together in the holes provided in the spent tape chute.

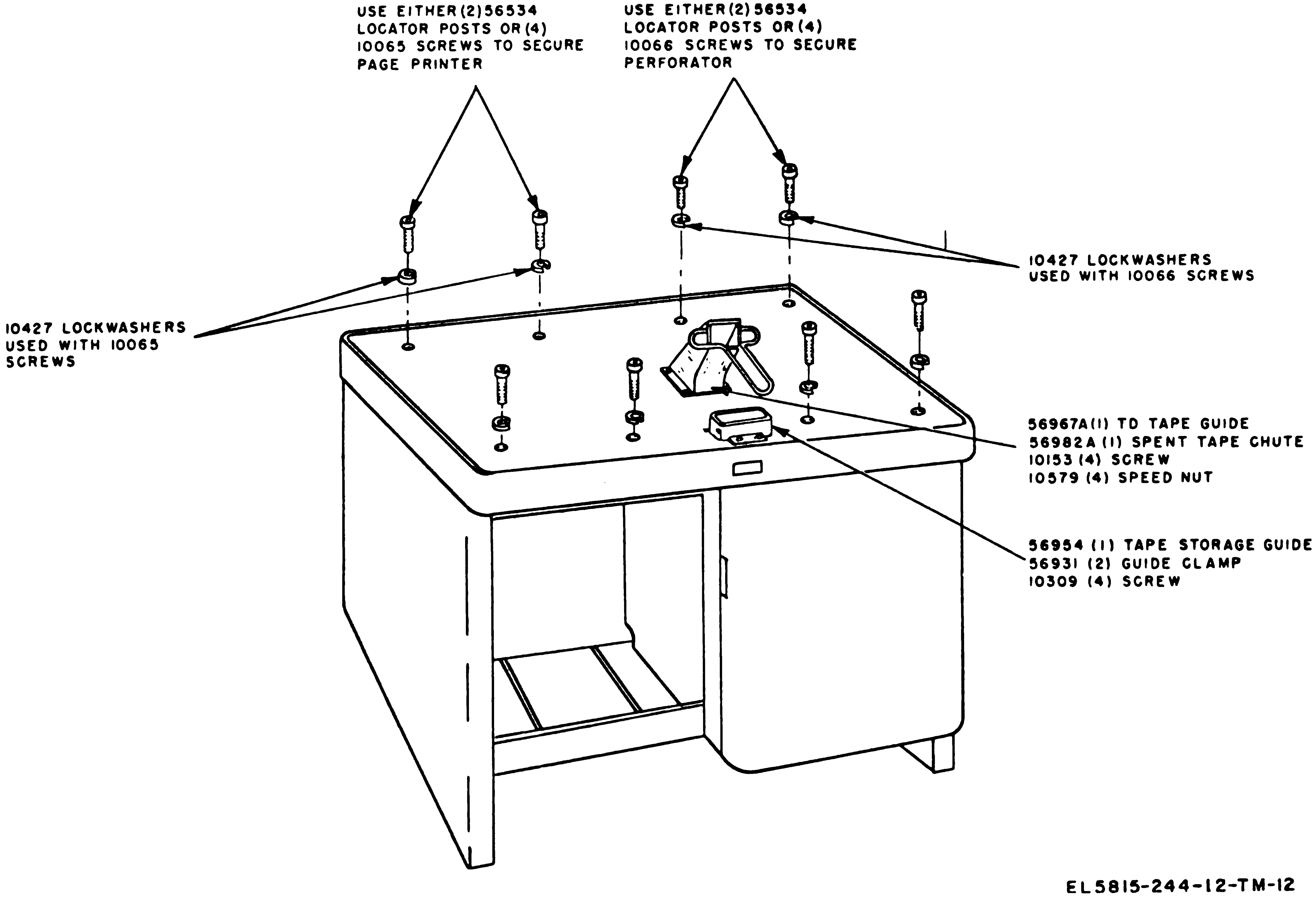

USE EITHER (2) 56534 LOCATOR POSTS OR (4) 10065 SCREWS TO SECURE PAGE PRINTER
USE EITHER (2) 56534 LOCATOR POSTS OR (4) 10066 SCREWS TO SECURE PERFORATOR
10427 LOCKWASHERS USED WITH 10065 SCREWS
10427 LOCKWASHERS USED WITH 10066 SCREWS
56967A (1) TD TAPE GUIDE
56982A (1) SPENT TAPE CHUTE
10153 (4) SCREW
10579 (4) SPEED NUT
56954 (1) TAPE STORAGE GUIDE
56931 (2) GUIDE CLAMP
10309 (4) SCREW
EL5815-244-12-TM-12

*Figure 2-4. Mounting details.*

*b. Tape Storage Guide.*

(1) Position the tape storage guide (56954) over the large hole in the front center of the tabletop.

(2) Place the two guide clamps (56391) on either side of the tape storage guide and parallel to the front of the table.

(3) Fasten the guide clamps to the table with the four screws (10309).

*c. Page Printer and Perforator.* The page printer and the perforator may be secured in place in either of two ways, depending on the installation site. The units may be placed on locating studs fastened into the table or they may be bolted in place. The determining factor is the amount of vibration that might be encountered.

(1) Position the page printer and the perforator on the table so that the four mounting holes in each base casting are alined with the mounting holes in the tabletop.

(2) If the units are to be used with locator studs only, insert four screw posts (56534) into the table, one through each of the mounting holes at the rear of the page printer and the perforator.

(3) If the units are to be bolted in place, insert one ¼-20 by 2-inch bolt (10065) and lockwasher (10427) through each mounting hole of the page printer, and one ¼-20 by 1¾-inch bolt (10066) and lockwasher (10427) through each mounting hole of the perforator.

*d. Extra Copyholder.*

(1) Remove the page printer dust cover (fig. 2-1).

(2) Place the nut plate associated with the copyholder (fig. 2-3) inside the dust cover and aline its holes with the mounting holes in the dust cover.

(3) Position the extra copyholder against the exterior of the dust cover and in alinement with the mounting holes.

(4) Fasten the extra copyholder to the dust cover with the four screws and lockwashers provided with the extra copyholder.

(5) Replace the page printer dust cover.

*e. Control Box (AN/FGC-52, AN/FGC-52X, AN/FGC-68, AN/UGC-30 and AN/UGC-30X ).*

(1) Remove the five machine screws and lockwashers that hold the cover to the base.

(2) Install the base on the table with the mounting holes towards the front and secure with the two machine screws, lockwashers, and flat washers provided.

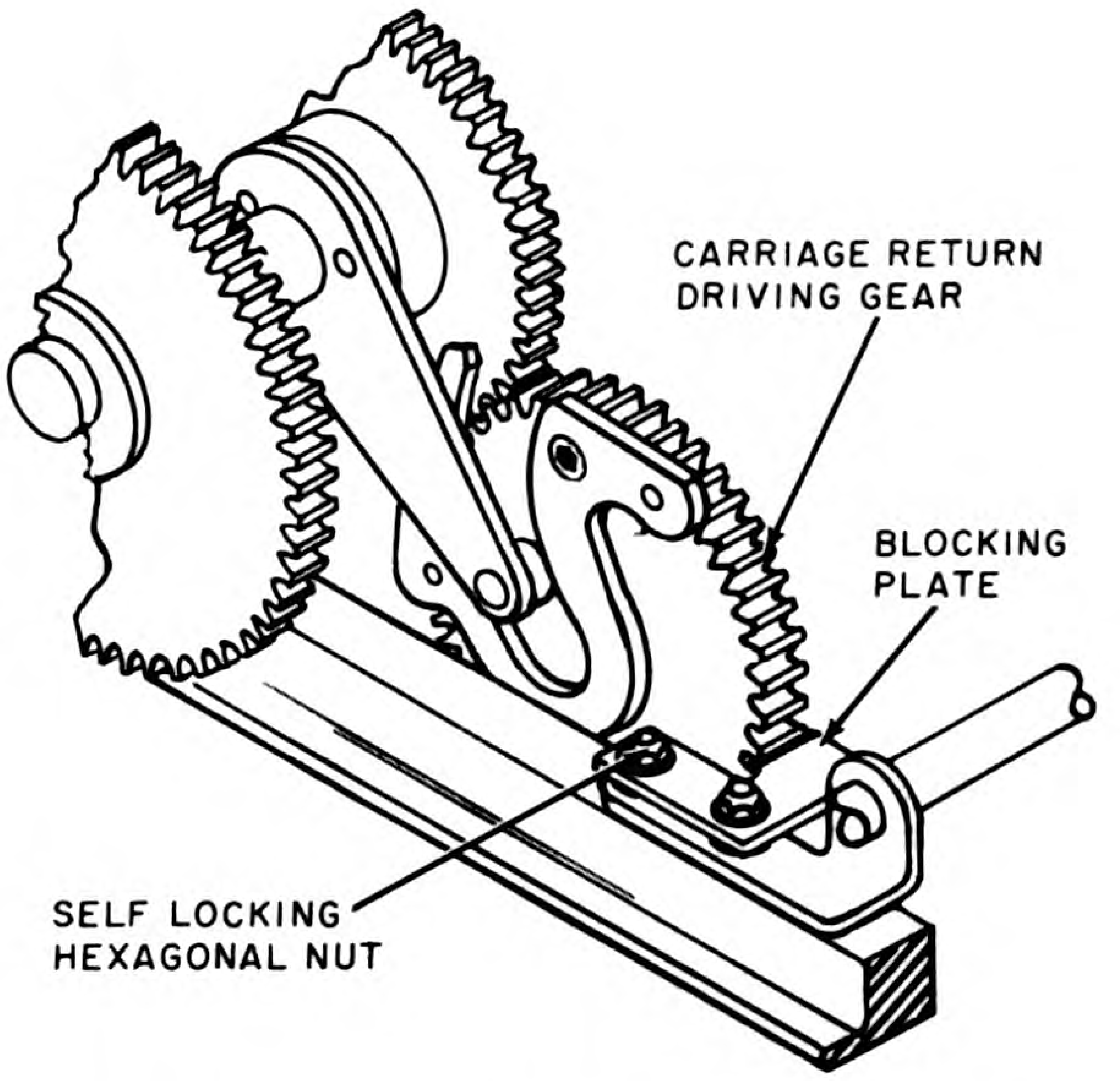
(3) Replace the cover and secure it with the five machine screws and lock-washers.

*f. Clearing Locking Devices of Page Printer.*

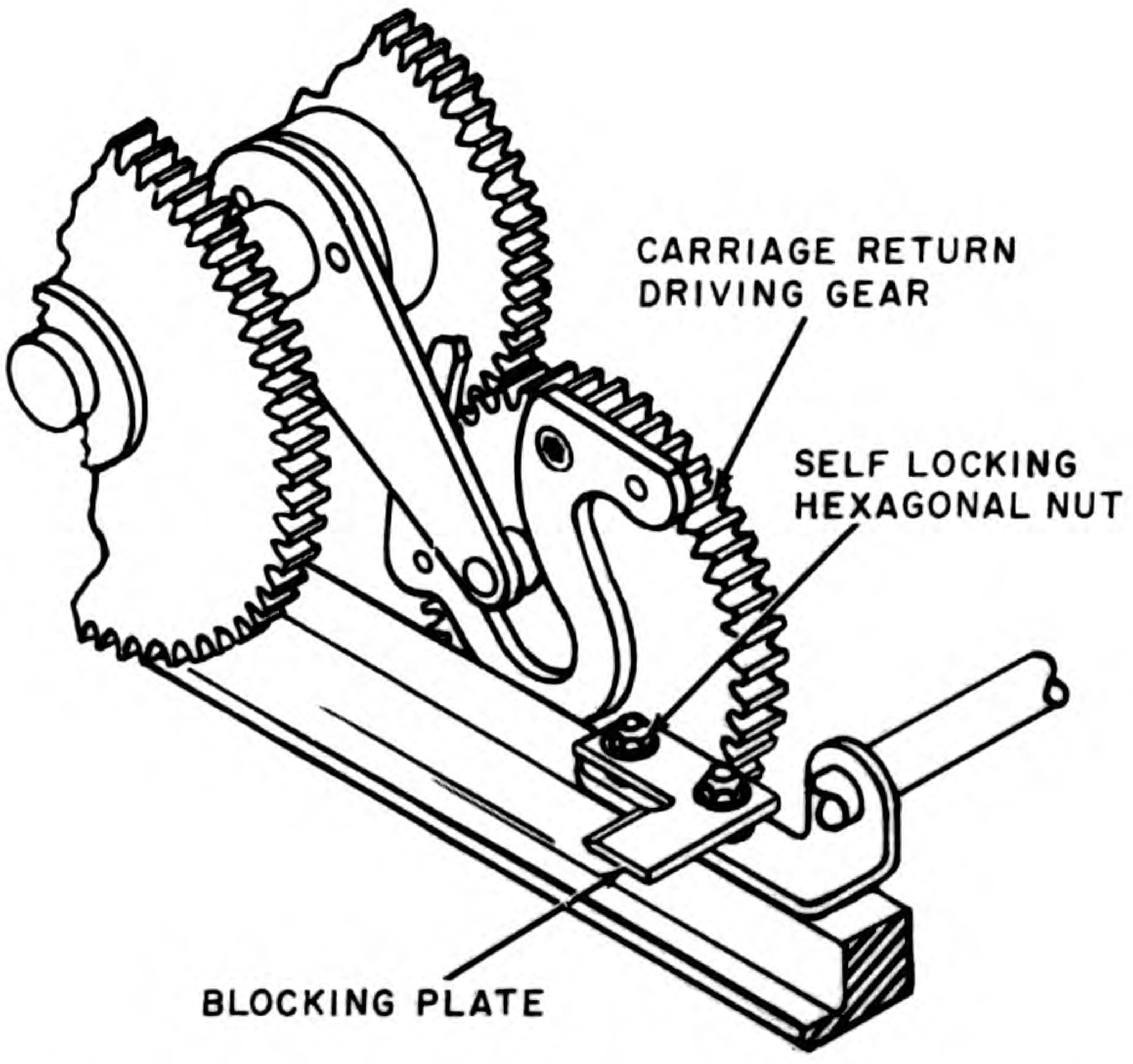
(1) Check the carriage lockup arm; if it is engaged, loosen the wingnut and swing the carriage lockup arm free of the carriage locking stud.

(2) Check the platen lockup arm; if it is engaged, loosen the wingnut and swing the platen lockup arm free of the platen locking stud.

(3) Check the blocking plate; if it is in the shipping position (A, fig. 2-5), remove the self-locking hexagonal nuts and remove the blocking plate. Install the blocking plate in the machine-operating position (B, fig. 2-5) and secure it in place with the two self-locking hexagonal nuts.



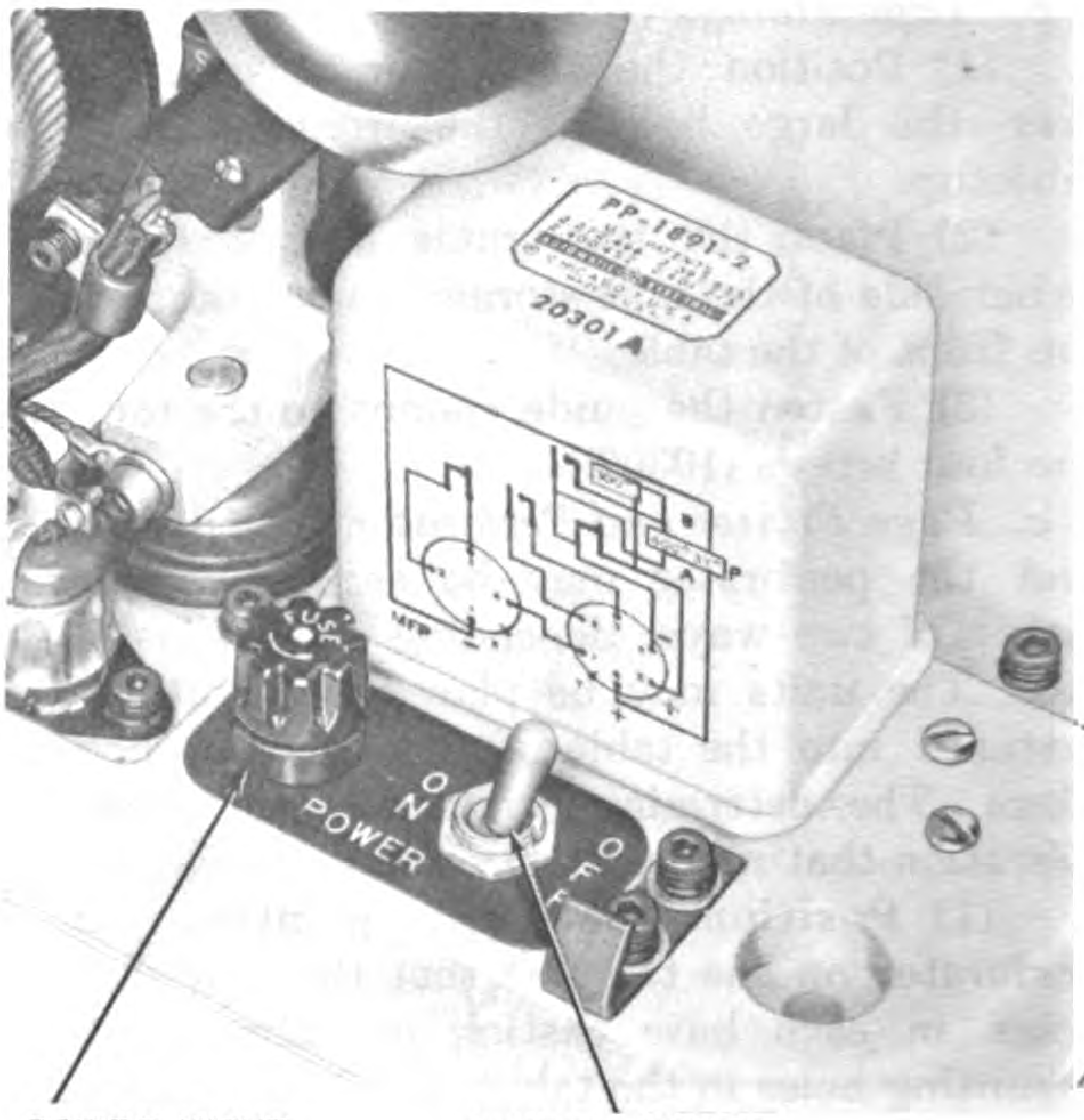
**A.** BLOCKING PLATE IN SHIPPING POSITION



**B.** BLOCKING PLATE IN MACHINE OPERATING POSITION

EL5815-244-12-TM-13

*Figure 2-5. Blocking plate positions.*



EL5815-244-12-TM-14

*Figure 2-6. Page printer power input fuses and POWER switch location (except TT-666/FG, TT-666A/FG, TT-666B/FG, TT-668/FG, TT-668A/FG, TT-668B/FG ).*

## 2-6. Interunit Cable Connections

After the components are in place, interconnect the components as follows:

*a.* Feed the ends of the keyboard cable assembly and the perforator cable assembly through the openings provided in the tabletop. Interconnect the two cables beneath the table.

*b.* Insert the red plug of the receive cable (fig. 2-8) from the page printer terminal box into the REC PRINTER jack (fig. 2-9) on the rear control panel of the perforator.

*c.* Insert the black plug of the send cable (fig. 2-8) from the page printer terminal box into the SEND PRINTER jack (fig. 2-9) on the rear control panel of the perforator.

## 2-7. Fuse Check (AN/FGC-161 and AN/FGC-162)

Check the value of each fuse listed in the chart before applying power to the unit.

| *Fuse* | *Component* | *Fuse rating (amps )* | *Reference (fig )* |
|---|---|---|---|
| Power input | Page printer | 1.6 | 2-6 |
| Low level conversion circuit | Page printer | ¼ | 2-7 |
| Line circuit | Perforator | ¾ | 2-12 |
| Power circuit (2) | Perforator | 4 | 2-12 |
| Low level conversion circuit | Perforator | ¾ | 2-12 |

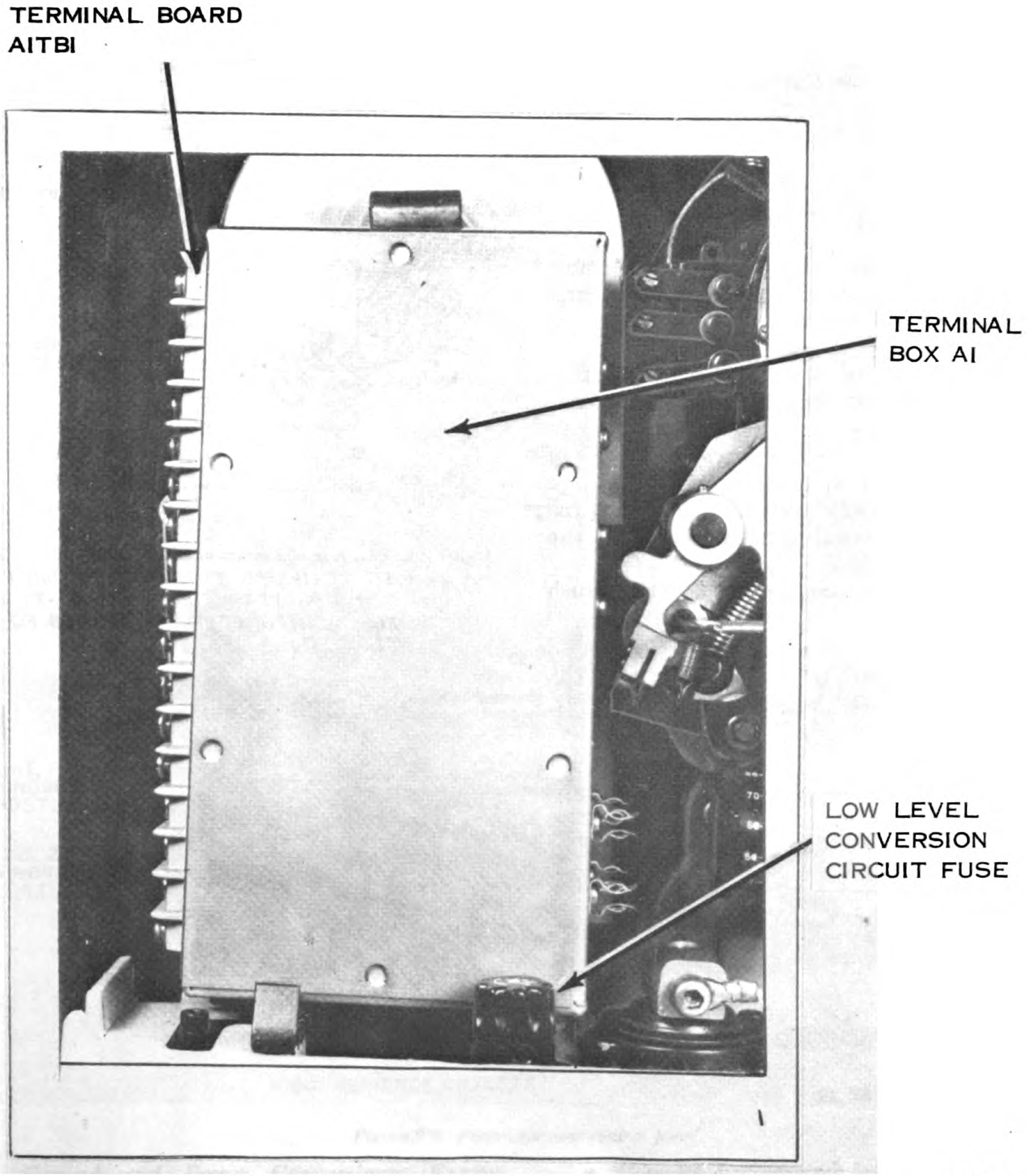


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*Figure 2-7. Page printer low level conversion circuit fuse and terminal box (TT-666/FG, TT-666A/FG, TT-666B/FG, TT-668/FG, TT-668A/FG, and TT-668B/FG ).*

## 2-8. Installation of Fuses, Lamps, and Brushes (Except AN/ FGC-161 and AN/ FGC-162)

*a.* Check the value of each of the fuses listed in the chart below before applying power to the unit.

| *Fuse* | *Component* | *Fuse rating (amps )* | *Reference (fig )* |
|---|---|---|---|
| Power input | Page printer | 1.6 | 2-6 |
| Bias | Page printer | 1/16 | 2-8 |
| Line circuit | Perforator | ¼ | 2-9 |
| Power circuit (2) | Perforator | 4 | 2-9 |
| Bias circuit | Perforator | ½ | 2-9 |

*b.* The copy lamps of the page printer and the perforator are located on the interior of the forward panel of their respective covers. If it becomes necessary to replace a lamp, proceed as follows:

(1) Remove the dust cover.

(2) Press the lamp into its socket with a slight pressure, turn the lamp, and pull it from its socket.

(3) Insert the new lamp into the socket and secure it in place by turning it slightly.

(4) Replace the dust cover.

*c.* If the motor fails to operate or the motor speed is erratic, check the motor brushes and replace them if necessary.

(1) Remove the dust cover.

(2) Unscrew the brush shields located at either side of the motor, just behind the governor cover, and remove the shields.

(3) Use a screwdriver to remove the brush cap and extract the brush cap and brush.

(4) Replace each of the brushes by guiding the brush through the slotted portion of the brushholder.

(5) Replace the brush cap and the brush shield.

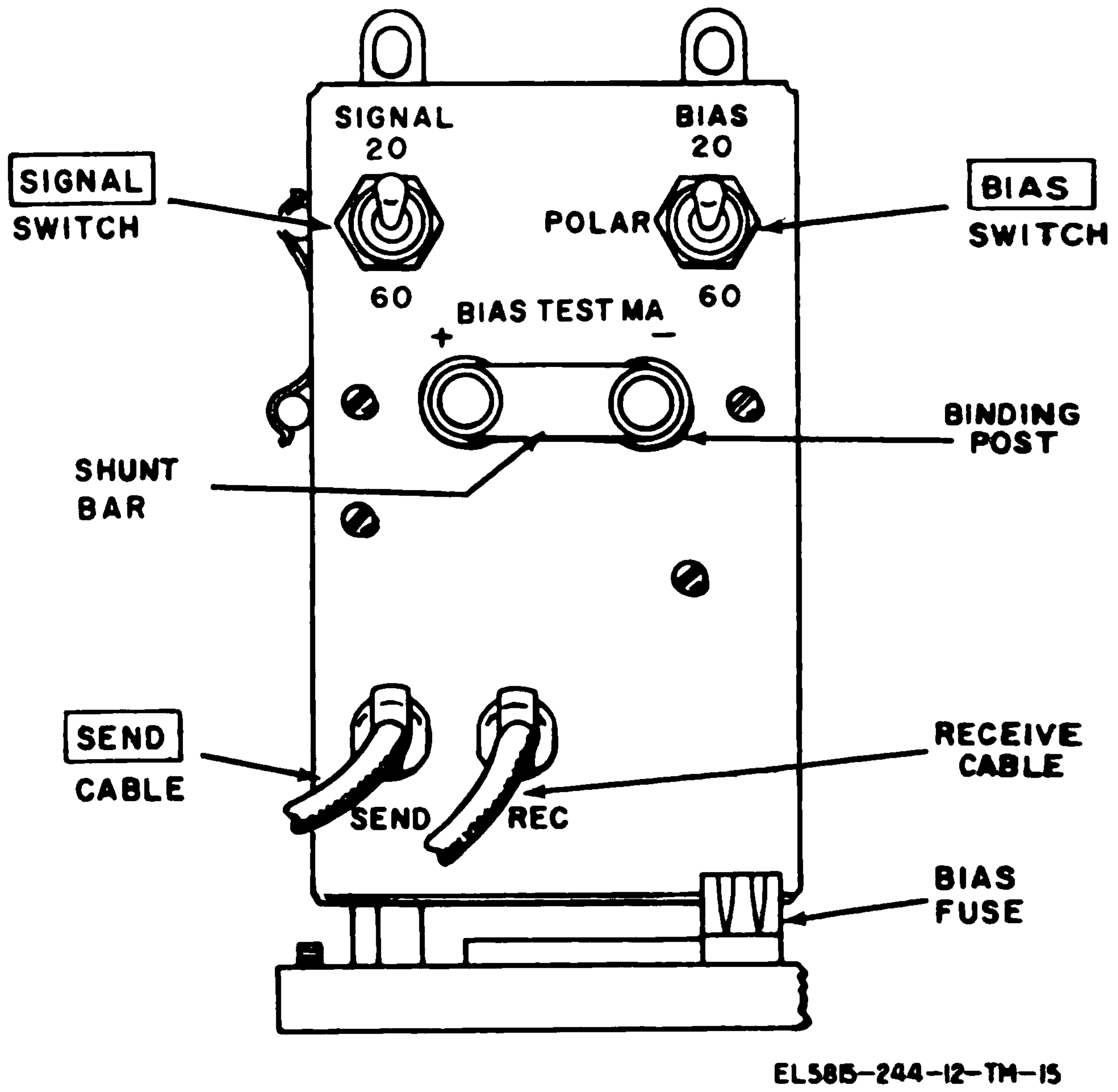
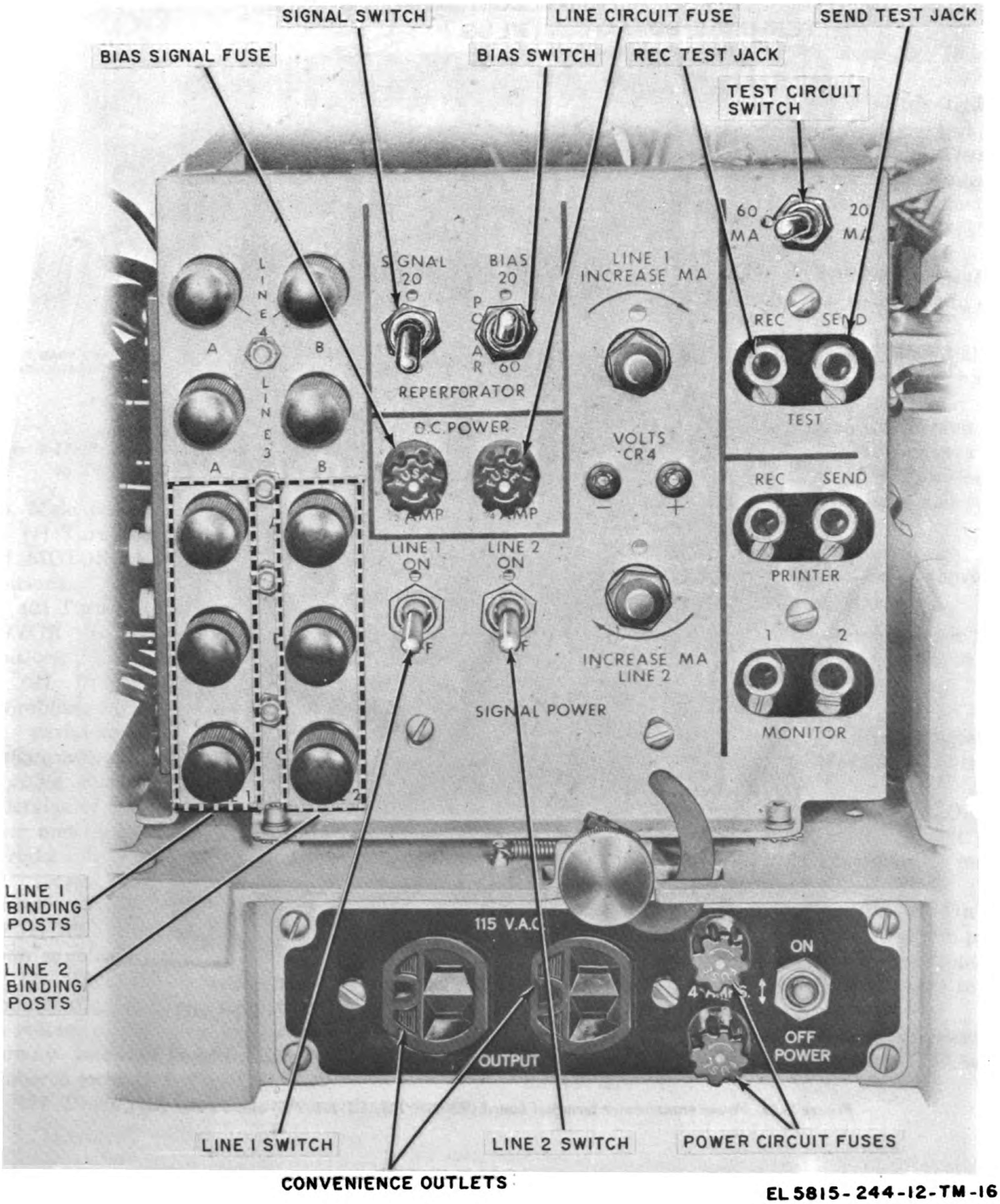


*Figure 2-8. Bias fuse and terminal box (TT-117A/FG, TT-118/FG, TT-119A/FG, TT-117B/FG, TT-119B/FG, TT-120/FG, TT-269/FG, TT-269A/FG, TT-269B/FG, TT-271/FG, TT-271A/FG, TT-271B/FG, and TT-396/FG ).*



EL 5815-244-12-TM-16

*Figure 2-9. Perforator rear control panel.*

## 2-9. Ground and Power Connections (Except AN/FGC-161 and AN/ FGC-162)

*a.* Connect the ground lead on the perforator power cable assembly to a low resistance ground.

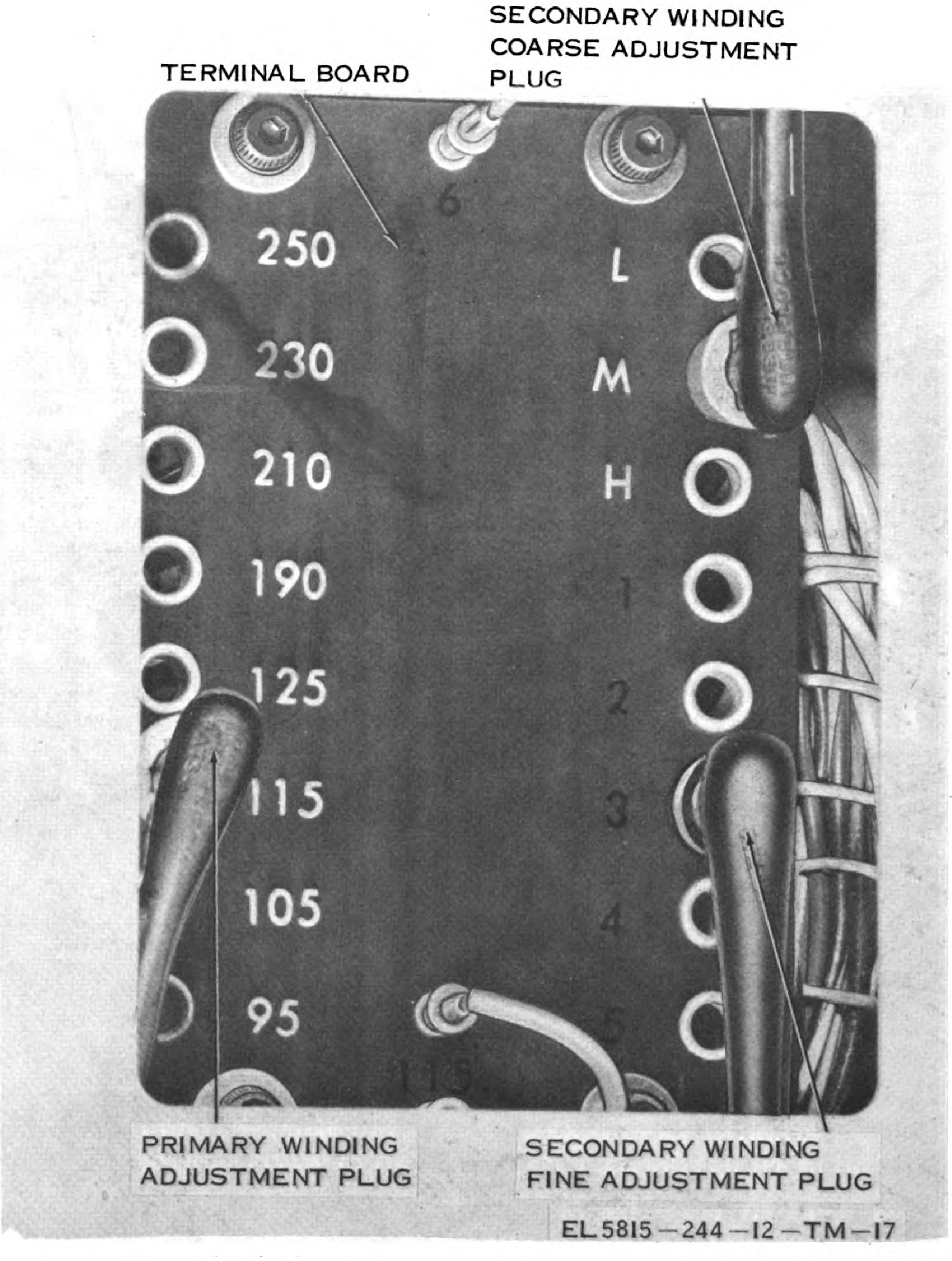

SECONDARY WINDING COARSE ADJUSTMENT PLUG
TERMINAL BOARD
6
250
230
210
190
125
115
105
95
L
M
H
1
2
3
4
5
115
PRIMARY WINDING ADJUSTMENT PLUG
SECONDARY WINDING FINE ADJUSTMENT PLUG
EL 5815-244-12-TM-17

*Figure 2-10. Power transformer terminal board (TT-178/FG, TT-179/FG, and TT-667/FG ).*

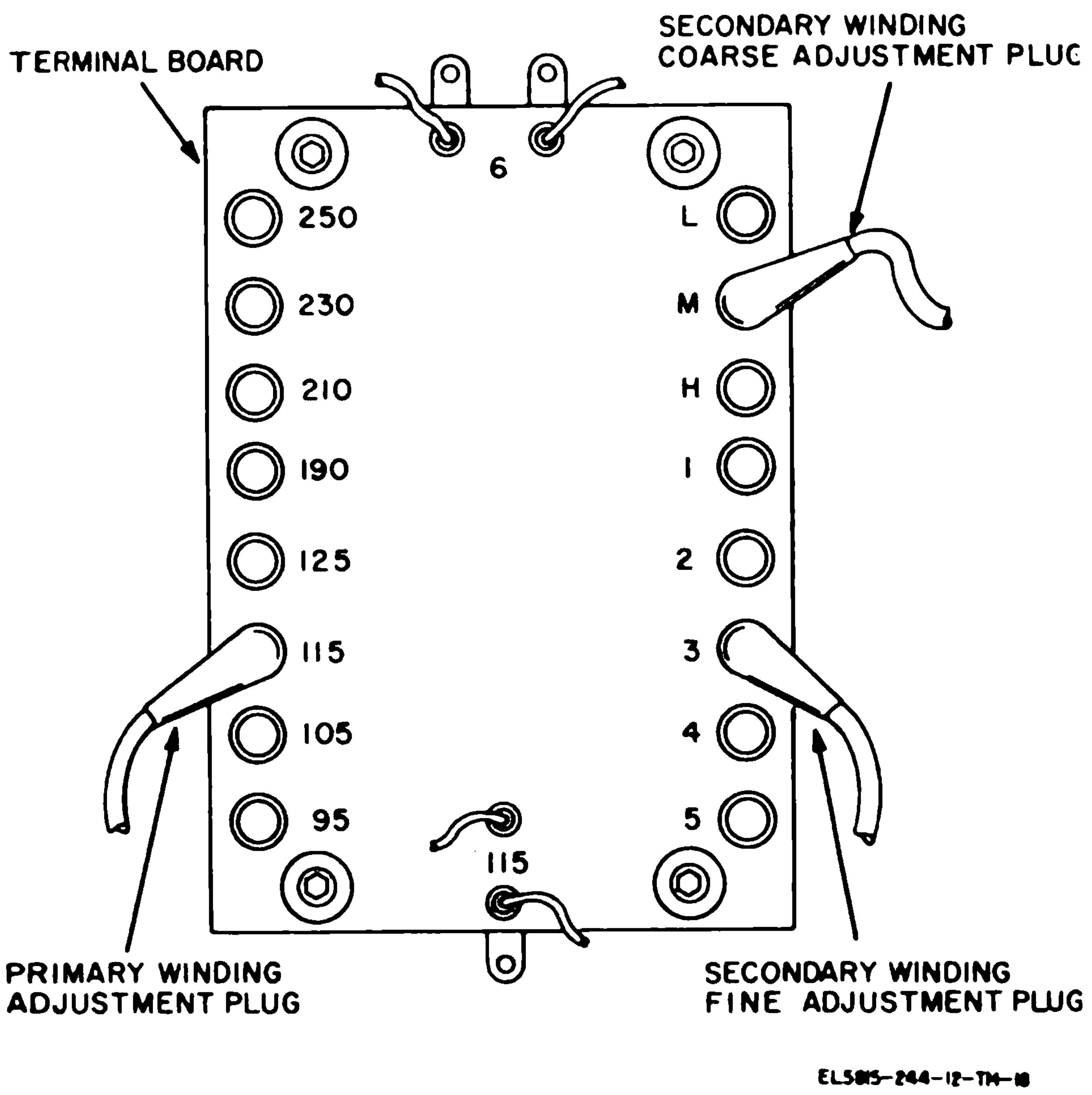

TERMINAL BOARD
SECONDARY WINDING COARSE ADJUSTMENT PLUG
6
250
230
210
190
125
115
105
95
115
L
M
H
1
2
3
4
5
PRIMARY WINDING ADJUSTMENT PLUG
SECONDARY WINDING FINE ADJUSTMENT PLUG
EL5815-244-12-TM-10

*Figure 2-11. Power transformer terminal board (not applicable to TT-178/FG, TT-179/FG, and TT- 667/FG ).*

*b.* Make power connections as follows:

(1) Turn the page printer POWER (fig. 2-6) and MOTOR (A, fig. 2-15) switches to the OFF positions.

(2) Turn the perforator POWER (fig. 2-9) and MOTOR (B, fig. 2-15) switches to the OFF positions.

(3) Before installing the power cable assemblies, adjust the power supply transformer of the perforator. The perforator power supply transformer plugs and jacks (figs. 2-11 and 2-12) may be reached through an opening on the underside of the perforator base. Remove the dust cover and tip the perforator, allowing it to rest on its right side.

*c.* Adjust the power supply transformer as follows:

(1) With a voltmeter, check the voltage of the power supplied by the outlet to be used.

(2) Place the center flexible lead (primary winding) (figs. 2-11 and 2-12) into the jack nearest the voltage of the power available. If the voltage is midway between numbers, use the higher-numbered jack.

(3) Place the secondary winding coarse adjustment lead into the jack marked M. Place the fine adjustment lead into the jack marked 3.

*d.* Insert the page printer power cable assembly in the 115 V. A. C. convenience outlet (fig. 2-8) at the back of the perforator.

*e.* Insert the power cable assembly from the perforator into the wall outlet.

*f.* Turn the perforator POWER switch (fig. 2-10) to ON and check the voltage across the test jacks to the right of the line circuit fuse. Turn the perforator power switch to OFF and change the position of the secondary winding fine adjustment plug (fig. 2-11), if necessary, to obtain a 115-volt reading.

*g.* Turn the page printer POWER switch (fig. 2-6) to ON and use the following procedure to check the bias current.

(1) Remove the shunt bar (fig. 2-8) and connect a milliameter between the two binding posts marked BIAS TEST MA.

(2) Read the current in the bias circuit. The milliameter should indicate 12 milliamperes (ma) when the BIAS switch is in the 60 ma position and 8.2 ma when the BIAS switch is in the 20 ma position.

(3) If necessary, adjust as required.

*h.* Follow the same procedure as *a* above and check the bias circuit of the perforator.

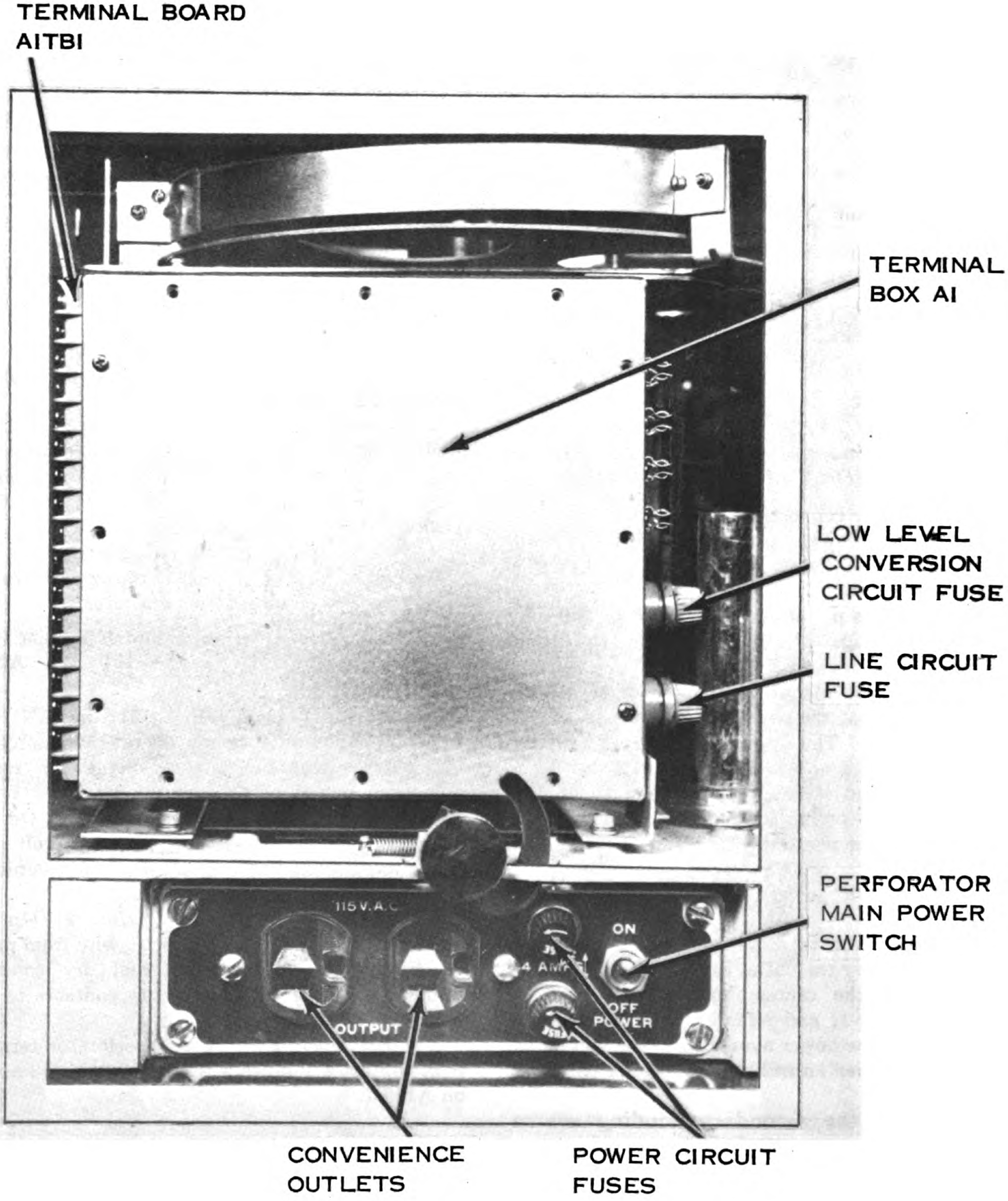
### 2-10. Transmitter-Distributor Clutch Magnet Input Connection (AN/ FGC-161 and AN/ - FGC-162)

Teletypewriter Sets AN/FGC-161 and AN/FGC-162 are capable of being operated remotely or locally. Two options are available for remote operation.

*a. Remote Operation, Option 1.* On the perforator terminal box, connect a +6-volt pulse source or a constant +6-volt source across pins 14 (+) and 15 (—) of A1TB1.

*b. Remote Operation, Option 2.* On the perforator terminal box, connect a wire from pin 13 of A1TB1 to a set of external dry contacts. Connect the other end of the dry contacts to pin 14 of A1TB1.

*c. Local Operation.* On the perforator terminal box, contact a jumper wire between pins 13 and 14 on A1TB1.



EL5815—244—12—TM—79

*Figure 2-12. Perforator rear control panel (TT-667/FG, TT-667A/FG, TT-667B/FG, TT-669/FG, and TT-669A/FG).*

### 2-11. Ground, Power, and Intermachine Connections (AN/ FGC-161 and AN/ FGC-162)

*a.* Connect the ground lead on the perforator power cable assembly to a low resistance ground.

*b.* Interconnect the machines as follows:

(1) Feed the ends of the keyboard cable assembly through the openings provided in the table top. Interconnect the two cables beneath the table.

*c.* Make the power connections as follows:

(1) Turn the page printer POWER (fig. 2-6) and MOTOR (A, fig. 2-20) switches to the OFF position.

(2) Turn the perforator POWER (fig. 2-12) and MOTOR (B, fig, 2-20) switches to the OFF positions.

(3) Before installing the power cable assemblies, adjust the power supply transformer of the perforator. The perforator power supply transformer plugs and jacks (figs. 2-10 or 2-11) may be reached through an opening on the underside of the perforator base. Remove the dust cover and tip the perforator, allowing it to rest on its jack side.

*d.* Adjust the power supply transformer as follows:

(1) With a voltmeter, check the voltage of the power supplied by the outlet to be used.

(2) Place the center flexible lead (primary winding) (figs. 2-10 or 2-11) into the jack nearest the voltage of the power available. If the voltage is midway between numbers, use the higher-numbered jack.

(3) Place the secondary winding coarse adjustment lead into the jack marked L. Place the fine adjustment lead into the jack marked 1.

*e.* Insert the page printer power cable assembly into the 115 V. A. C. convenience outlet (fig. 2-12) at the back of the perforator.

*f.* Insert the power cable assembly from the perforator into the wall outlet.

## Section III. PRELIMINARY CHECKS AND LUBRICATION PROCEDURES

NOTE

The procedures described in this section should be performed by qualified teletypewriter maintenance personnel.

### 2-12. Extent of Preliminary Checks and Adjustments

This section covers the checks and lubrication procedures that must be made before the equipment can be operated or installed in a working circuit.

### 2-13. Initial Checks Connections and Adjustments

*a. Local Test Patch Panel Connections (Except AN/FGC-161 and AN/FGC-162 ).* The patch panel on the perforator controls the signal circuits in the set. Before local testing, set up the panel for the local test condition. Make the connections indicated in the chart under patch panel condition A in paragraph 3-4 to place all receiving mechanisms and sending mechanisms in series.

*b. Local Test Terminal Board Connections (AN/FGC-161 and AN/FGC-162 ).* The patching accomplished on terminal boards of the page printer (fig. 2-7) and perforator (fig. 2-12) controls the signal circuits in the set. Before local testing, make the connections in the chart under terminal board patching condition B, Operation 3 (paragraph 2-26*b* and 2-27*b* ) to place the set in the condition for performance testing (fig. 2-13).

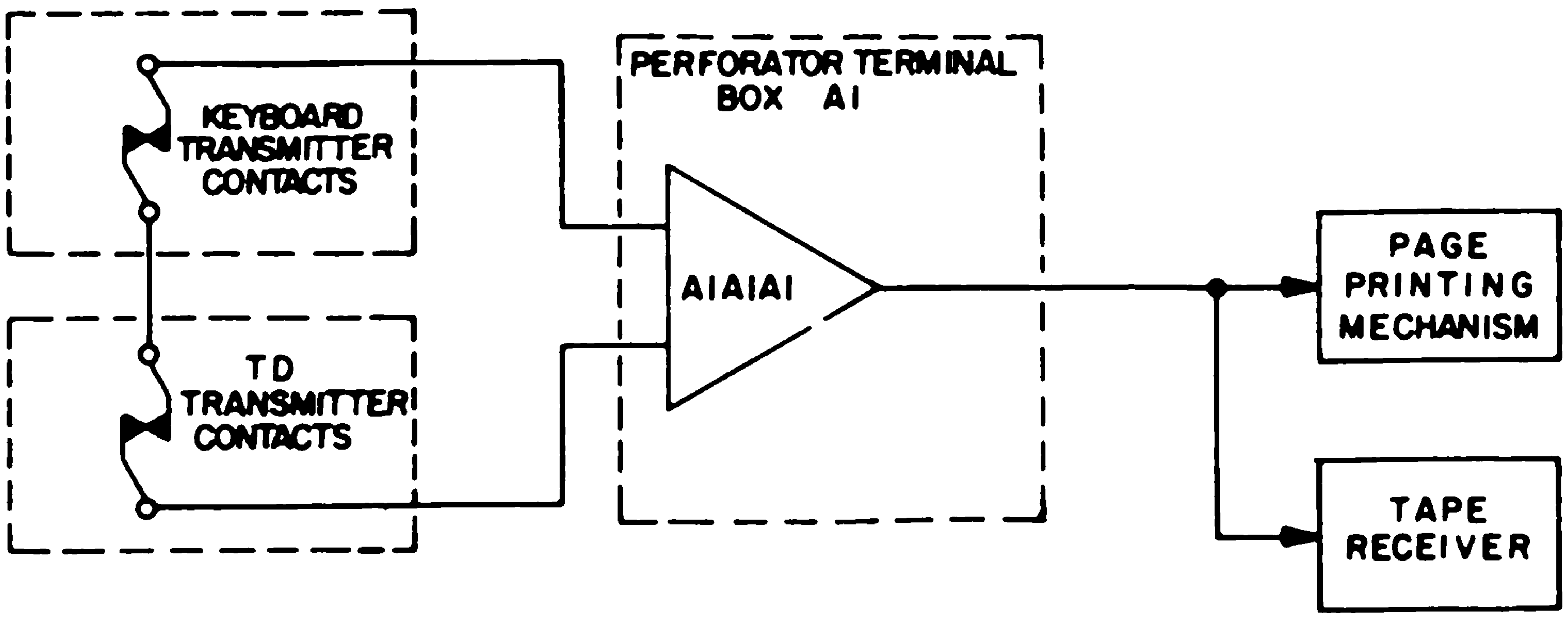


*Figure 2-13. Terminal Board Patching Condition B, Operation 3 (AN/FGC-161 and AN/FGC-162 ).*

*c. Local Test Control Page Printer Settings (Except AN/FGC-161 and AN/FGC-162).*

(1) Set the SIGNAL switch on the teminal box (fig. 2-8) to 20 or 60, depending upon the signal line to which the unit will be connected.

(2) Set the BIAS switch to the same setting as the SIGNAL switch.

(3) Set the SEND LOCK switch (A, fig. 2-15) to the SEND position.

(4) Turn the page printer POWER switch to ON (fig. 2-6).

(5) Turn the page printer LIGHT switch (A, fig. 2-15) to ON; the copy light should glow.

(6) Turn the page printer MOTOR switch to ON; the page printer motor should operate.

(7) Set the rangefinder dial (fig. 2-21) to 60 on the range scale.

*d. Local Test Control Perforator Settings.*

(1) Set the SIGNAL switch (fig. 2-9) to the same setting as the SIGNAL switch on the terminal box on the page printer.

(2) Set the BIAS switch to the same setting.

(3) Set the switch above the test jacks to the same setting.

(4) Turn the perforator POWER switch (fig. 2-9) to ON.

(5) Turn the perforator MOTOR switch (B, fig. 2-9) to ON; the perforator motor should operate and the copy light should glow.

(6) Set the rangefinder dial (fig. 2-17) to 60 on the range scale.

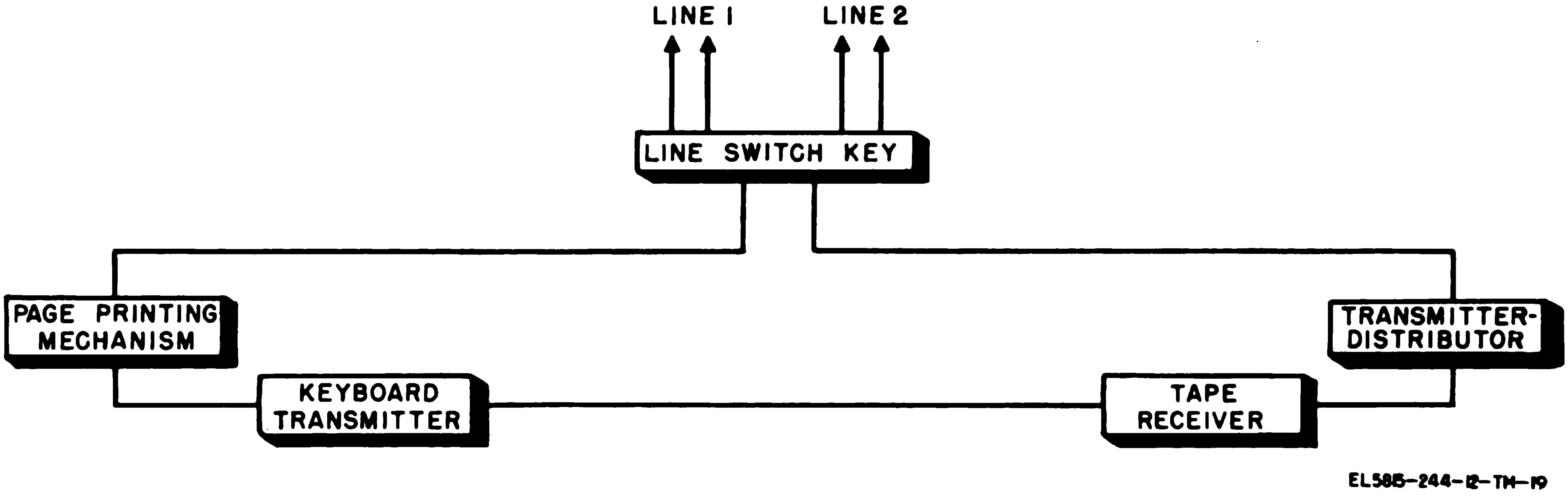


*Figure 2-14. Local test condition simplified circuit, condition A (except AN/FGC-161 and AN/FGC-162).*

*e. Local Test Control Perforator Settings (AN/FGC-161 and AN/FGC-162).*

(1) *Page printer.*

(a) Set the SEND LOCK switch (A, fig. 2-20) to the SEND position.

(b) Turn the page printer POWER switch to ON (fig. 2-6).

(c) Turn the page printer LIGHT switch (A, fig. 2-20) to ON; the copy light should glow.

(d) Turn the page printer MOTOR switch to ON; the page printer motor should operate.

(e) Set the rangefinder dial (fig. 2-21) to 60 on the range scale.

(2) *Perforator.*

(a) Turn the perforator POWER switch (fig. 2-12) to ON.

(b) Turn the perforator MOTOR switch (B, fig. 2-20) to ON; the perforator motor should operate and the copy light should glow.

(c) Set the rangefinder dial (fig. 2-22) to 60 on the range scale.

*f. Motor Speed Adjustment.* Adjust the motor speed as follows:

(1) Strike a tuning fork marked 180-vps against the palm of the hand. Do not strike the tuning fork sharply against a metal object, or the fork may be damaged.

(2) View the target spots at the end of the motor-governor subassembly through the vibrating shutter of the tuning fork.

(3) Make no adjustment if the target spots appear motionless when viewed through the vibrating shutter. If the spots appear to be moving clockwise (motor speed too fast), pull the end of the motor-governor adjustment worm outward. Hold it out until the apparent clockwise motion of the target spot has practically stopped. If the target spot appears to be moving counterclockwise (motor speed too slow), push the end of the motor-governor adjustment worm inward until the apparent counterclockwise motion of the target spot has practically stopped. To avoid

overadjustment, release the worm slightly before the spot comes to a complete standstill.

**2-14. Preliminary Lubrication**

Before operating the equipment, check the lubrication and adjustment of the friction clutches and the tension springs as directed below.

*a. Page Printer Friction Clutches and Transfer Lever Spring.*

(1) *Selector friction clutch* (fig. 2-16).

(a) *Lubrication.* Apply oil as shown in the following chart. Do not release the spring tension on friction clutches for periodic lubrication. If necessary to release the spring tension to provide a thorough cleaning during lubrication, loosen the clamping screw securing the spring positioning collars, turn the friction clutches by turning the motor by hand (or in the case of the transmitter friction clutch with the keyboard removed, turn the clutch itself), and apply oil. After collars are oiled, set them to give approximately the required spring tension on each friction clutch, run the page printer without printing for about 5 minutes, and then operate on repeat space for about 5 minutes. When lubrication is completed, set the spring tension of the friction clutches in accordance with instructions in (b), (2) (b), (3) (b), and (4) (b) below.

(b) *Adjustment.*

*1.* Loosen the clamping screw on the friction adjusting collar and turn the adjusting collar in the direction required to either increase or decrease the pressure applied by the spring of the friction clutch. Tighten the clamping screw and recheck the requirement. Refine the adjustment as required to obtain the proper torque.

*2.* If the proper torque cannot be obtained by adjusting the position of the friction adjusting collar on the drive shaft collar, loosen the clamping screw on the friction adjusting collar, screw the adjusting collar away from each side of the square shaft driving gear and install new oil-saturated felt washers. *Be sure the projections on the square shaft driving gear engage the holes in the felt washers.* Perform the adjustment procedure described in *1* above.

*3.* If the proper torque cannot be obtained by performing the procedures described in *1* and *2* above, replace the clutch pressure spring and perform the adjustment procedure described in *1* above.

(2) *Square shaft driving friction clutch* (fig. 2-16).

(a) *Lubrication.* Same as (1) (a) above.

(b) *Adjustment.*

*1.* Turn the motor off and loosen the clamping screw on the friction adjusting collar. Turn the collar in the proper direction and the proper distance to obtain the correct torque. Tighten the clamping screw and recheck the requirement.

*2.* If the proper torque cannot be obtained by performing the procedure described in *1* above, loosen the clamping screw and turn the friction adjusting collar to release the spring tension. Remove the felt washer from the fork until the two setscrews in the drive shaft collar are exposed. Loosen the setscrews slightly, slide the drive collar either toward the fork to increase torque, or away from the fork to decrease torque, as required, tighten the setscrews in the drive collar, and repeat the adjustment procedure described in *1* above.

*3.* If the proper torque cannot be obtained by performing the procedures described in *1* and *2* above, loosen the two setscrews slightly in the clutch disk that is closest to the fork. Slide the clutch disk either toward the friction clutch adjusting collar to increase torque, or away from the collar to decrease torque, as required, tighten the setscrews in the clutch disk, and repeat the adjustment procedure described in *1* above.

*4.* If the proper torque cannot be obtained by performing the procedures described in *1*, *2*, or *3* above, loosen the clamping screw in the friction adjusting collar, screw the collar away from the fork, press the center clutch disk toward the spring and remove the felt washer that is closer to the fork. Press the center clutch disk toward the fork and remove the other felt washer. Install new oil-saturated felt washers between the clutch disks. ***Be sure the projections on the center clutch disk engage the holes in the felt washers.*** Screw the friction clutch adjusting collar toward the fork and perform the adjustment procedure described in *1* above.

*5.* If the proper torque cannot be obtained by performing the procedures described in *1* through *4* above, replace the spring of the friction clutch and perform the adjustment described in *1* above.

(3) *Carriage-feed friction clutch* (fig. 2-15).

(a) *Lubrication.* Same as (1) (a) above.

(b) *Adjustment.* Turn the motor off, loosen the clamping screw in the adjusting collar, turn the adjusting collar to meet the requirement, and tighten the clamping screw. It may be necessary to move the carriage to position the clamping screw for tightening. Recheck the requirement and readjust if necessary.

(4) *Keyboard-transmitter friction clutch* (*fig. 2-16*).

(a) *Lubrication.* Same as (1) (a) above.

(b) *Adjustment.* With the motor off, loosen the clamping screw. Turn the adjusting collar in or out to meet the requirement; tighten the clamping screw. Turn the motor on and recheck the tension.

(5) *Carriage-return safety clutch* (fig. 2-16).

(a) *Lubrication.* Apply oil at the following places as shown in the chart below.

| Fig. No. | Item No. | Name of part | Method and quantity |
|---|---|---|---|
| 2-15 | 1 | Stop bar shift blade | Apply sparingly to latching surface. |
| 2-15 | 3 | Square shaft | Thin film all sides, entire length. |
| 2-15 | 4 | Carriage-feed pawl and ratchet wheel | Apply sparingly to teeth; 2 drops at each pawl pivot. |
| 2-15 | 5 | Carriage-return operating mechanism | 2 drops at each pivot point. |
| 2-15 | 6 | Manual carriage-return mechanism | Apply sparingly to all pivots and rubbing surfaces. |
| 2-15 | 9 | Carriage-return sliding clutch drum | Apply sparingly to teeth and annular grooves, 2 or 3 drops in each group of spline balls inside clutch. |
| 2-15 | 10 | Cariage-return safety clutch felt plates | Several drops around periphery of each washer. |
| 2-15 | 12 | Decelerating cam | Thin film on working surface. |
| 2-15 | 15 | Carriage-return clutch latch lever | 2 drops on pivot; thin film on working surfaces. |
| 2-15 | 16 | Carriage-feed clutch lever | 2 drops at pivot; thin film at each end. |
| 2-15 | 17 | Margin bell clapper and pawl | 1 or 2 drops at each pivot point and at tip of pawl. |
| 2-15 | 18 | Carriage-feed clutch | Apply sparingly to clutch teeth. |
| 2-15 | 19 | Carriage-feed sliding clutch drum | Apply sparingly to rubbing surfaces. |
| 2-15 | 20 | Platen lower case latch | 1 drop at pivot, apply sparingly to latching surface. |
| 2-15 | 21 | Code-ring locking bail shaft | 1 drop at blade and cam follower locking lever. |
| 2-15 | 22 | Function bellcrank pivots | Several drops between levers and washers. |
| 2-15 | 2 | Carriage-feed friction clutch | |
| 2-15 | 11 | Keyboard-transmitter friction clutch | 10 to 15 drops on each washer along periphery of felt friction plates; apply sparingly to spring and driving collar. |
| 2-16 | 17 | Selector friction clutch | |
| 2-16 | 18 | Square shaft driving friction clutch | |

(b) *Adjustment.* Turn the motor on, press the CAR RET key, and hold the space bar down until the clamping screw in the adjusting collar of the carriage-return safety clutch is accessible with a straight allen wrench. Turn the motor off and loosen the clamping screw. Turn the motor by hand clockwise to increase the tension; turn it counterclockwise to decrease the tension. Tighten the clamping screw, remove the wrench and recheck the requirement.

(6) *Page printer transfer lever spring.*

(a) *Lubrication.* None.

(b) *Adjustment.* Loosen the machine screw that secures the spring post eccentric, turn the eccentric to obtain the required tension, and tighten the machine screw.

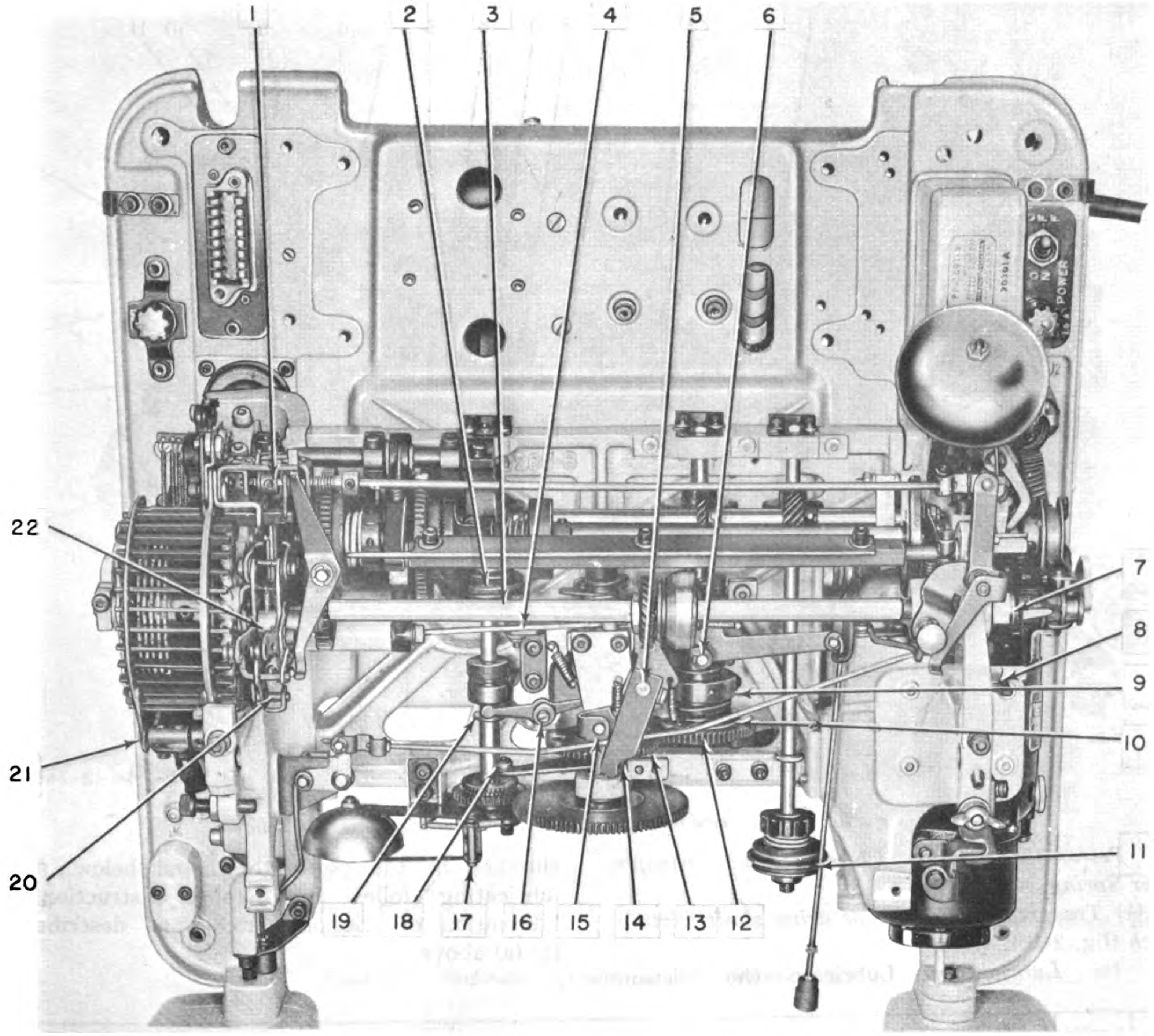


*Figure 2-15. Carriage and platen of page printing mechanism removed to show lubrication points.*

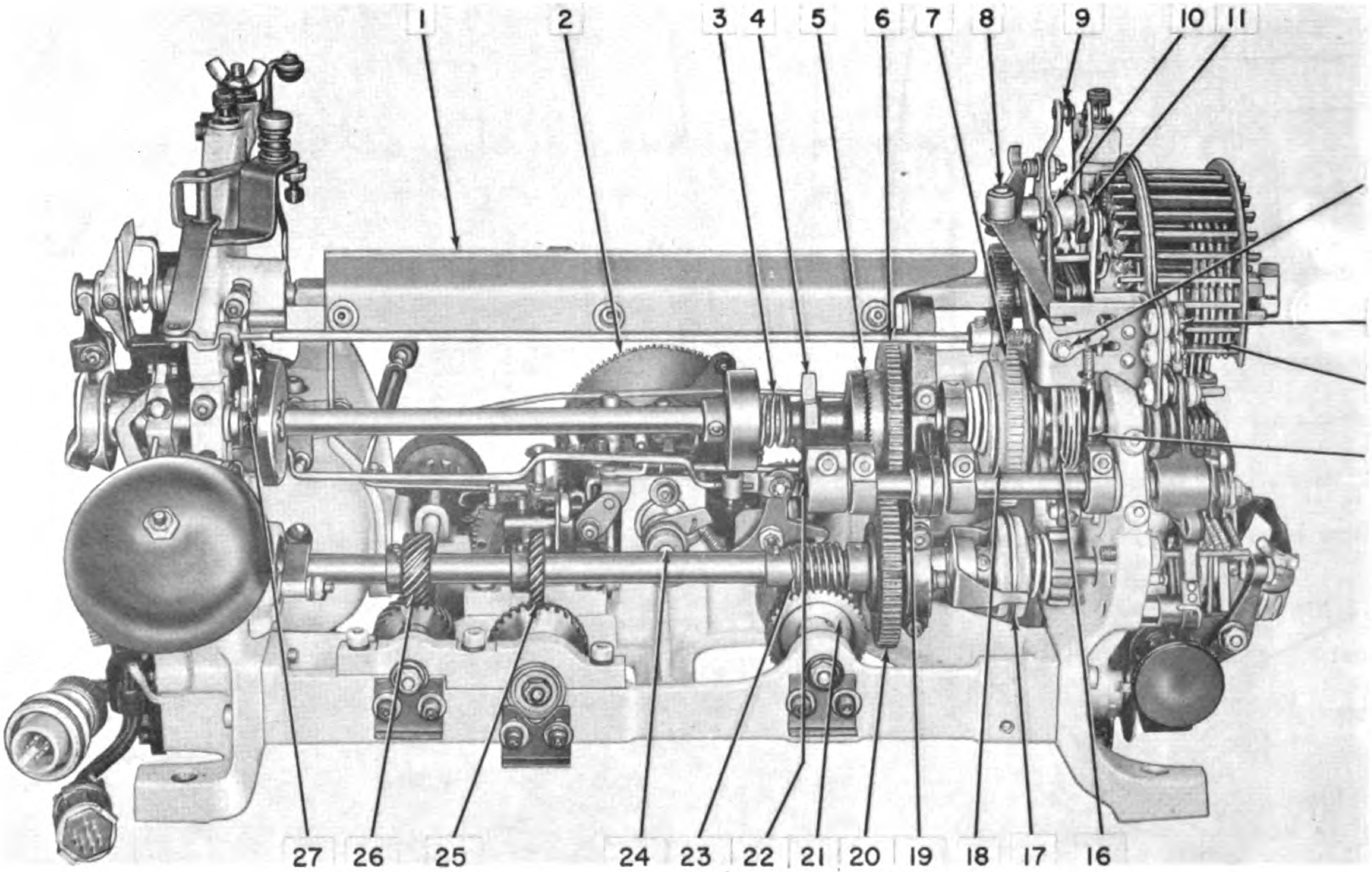


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*Figure 2-16. Page printing mechanism, rear view, showing lubrication points.*

*b. Perforator Friction Clutches and Transfer Lever Spring.*

(1) *Transmitter-distributor drive shaft friction clutch* (fig. 2-18).

(a) *Lubrication.* Lubricate the friction clutches of the perforator listed below. When lubricating, follow the detailed instructions for lubrication of friction clutches as described in (1) (a) above.

| Fig. No. | Item No. | Name of part | Method and quantity |
|---|---|---|---|
| 2-17 | 18 | Stop arm shaft friction clutch | 10 to 15 drops of oil on each disk along periphery of felt friction plates; apply sparingly to spring and collar. |
| 2-18 | 21 | Transmitter-distributor drive shaft friction clutch | |
| 2-19 | 2 | Selector camshaft friction clutch | |

(b) *Adjustment.* Loosen the clamping screw on the clutch collar and turn the collar until the clutch spring exerts moderate pressure on the clutch disk. Tighten the clamping screw on the collar and check the requirement. Readjust until the proper setting is attained.

(2) *Perforator transfer lever spring.*

(a) *Lubrication.* None.

(b) *Adjustment.* Loosen the machine screw and turn the transfer lever spring stop eccentric to meet the requirement; tighten the machine screw.

(3) *Stop arm-shaft friction clutch* (fig. 2-17).

(a) *Lubrication.* Same as (1) (a) above.

(b) *Adjustment.* With the motor off, loosen the clamping screw on the friction adjusting collar. Turn the friction adjusting collar in or out to meet the requirement; tighten the clamping screw and recheck the tension.

(4) *Selector camshaft friction clutch* (fig. 2-19).

(a) *Lubrication.* Same as (1) (a) above.

(b) *Adjustment.* Loosen the clamping screw of the friction clutch adjusting collar and screw the friction clutch adjusting collar on the drive shaft collar to obtain the desired tension. Tighten the clamping screw.

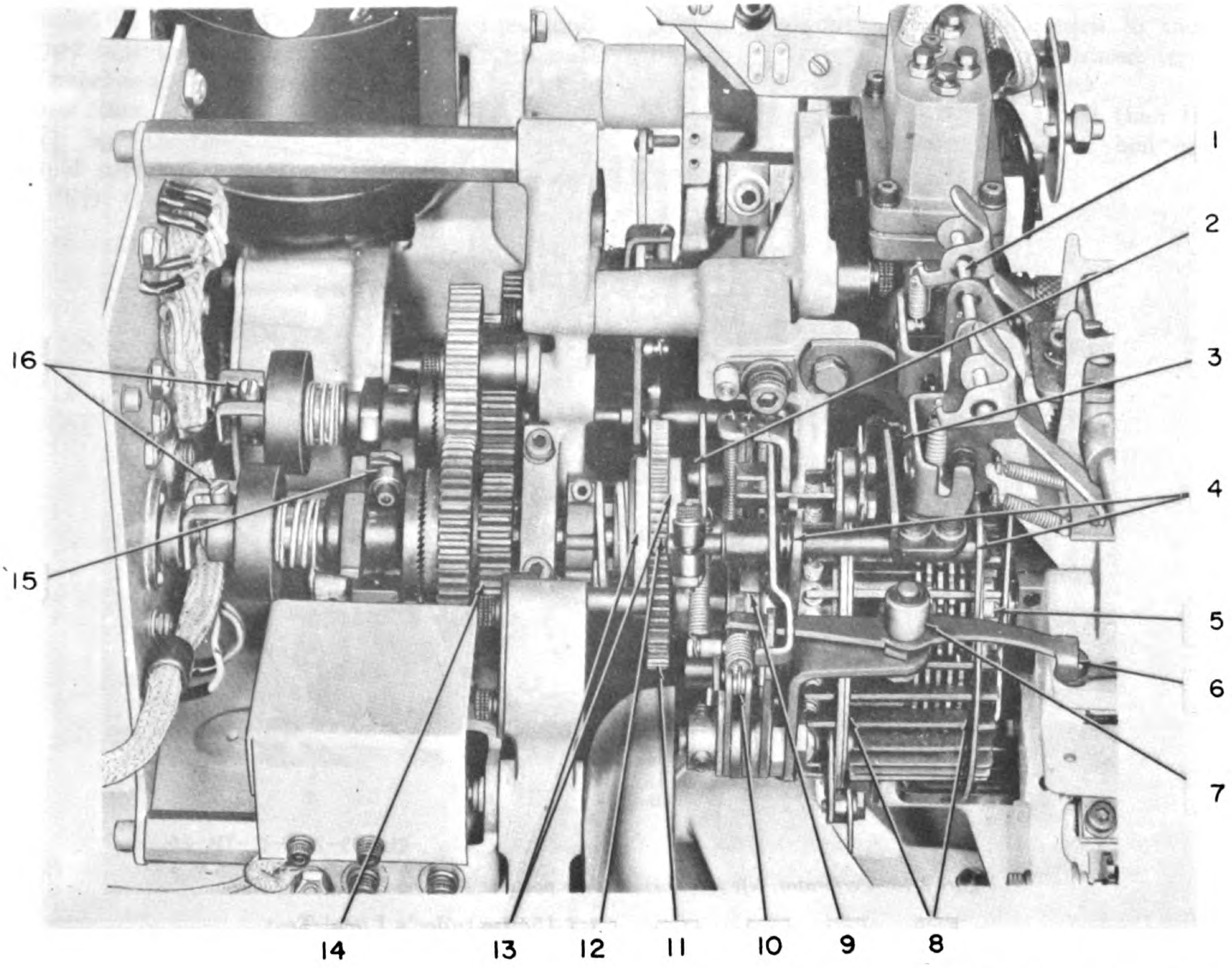

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*Figure 2-17. Perforator, left side, showing lubrication points.*

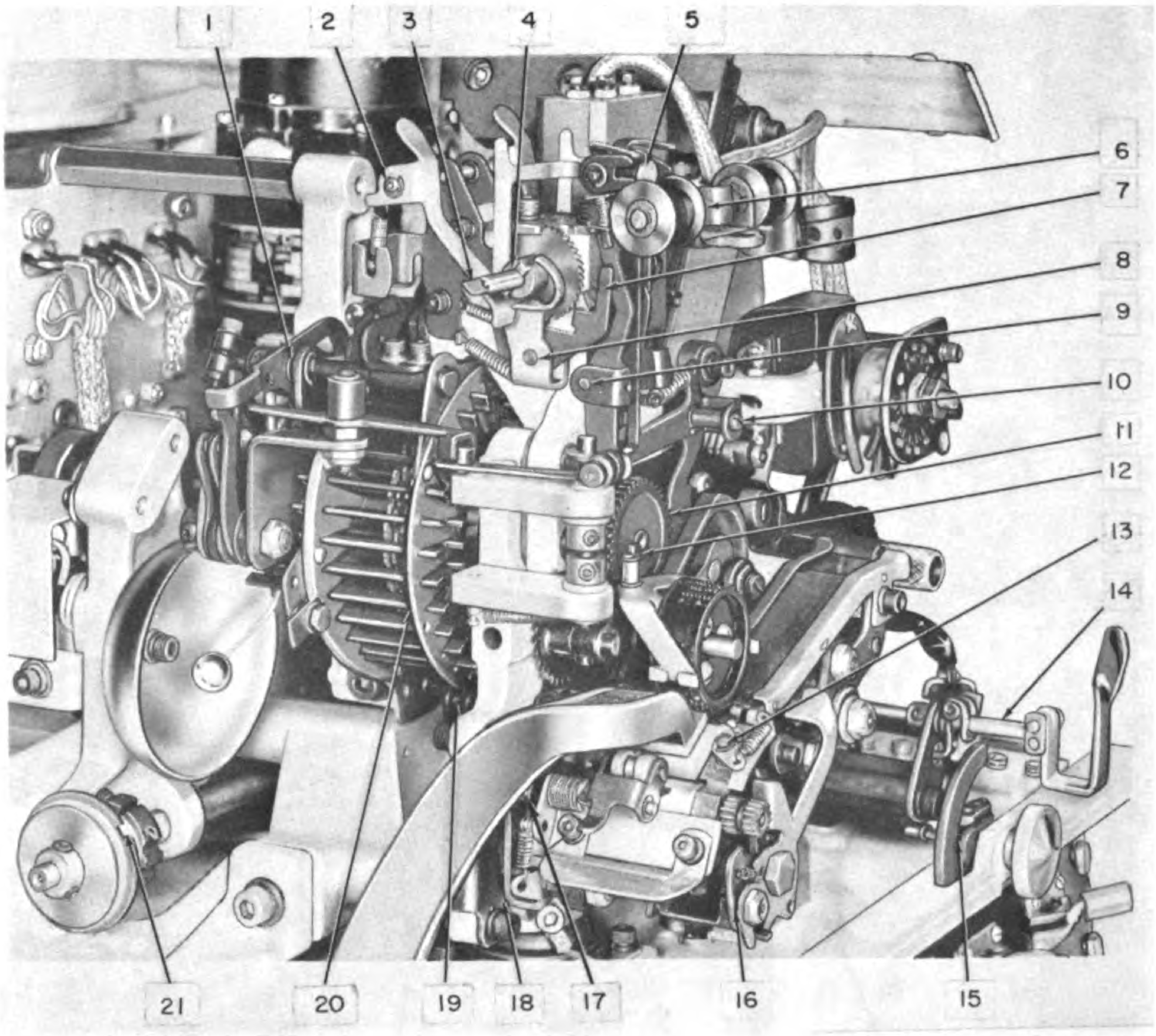

*Figure 2-18. Perforator, left front veiw, upper portion, showing lubrication points.*

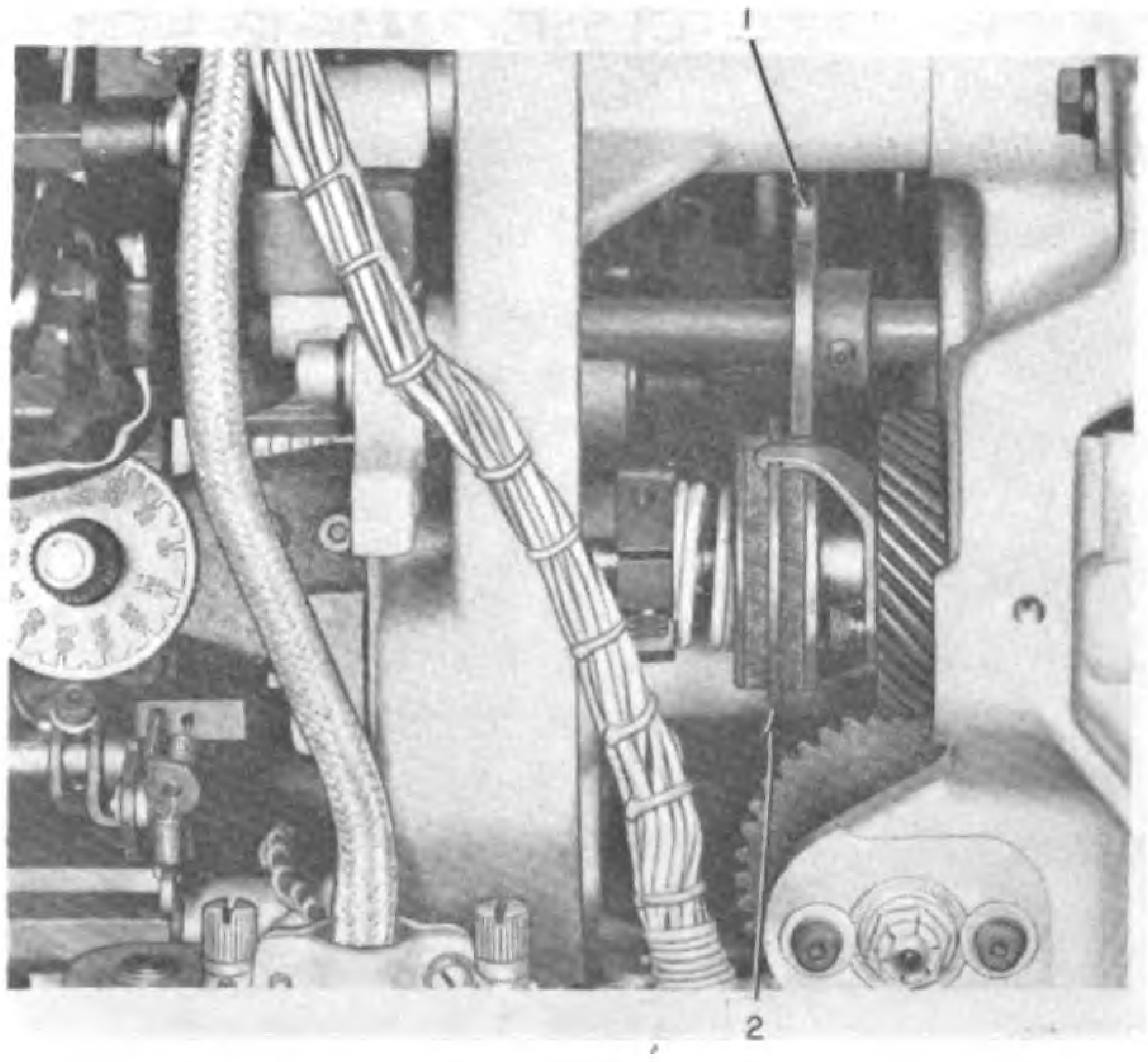

*Figure 2-19. Perforator main chassis, right side view, showing lubrication points.*

## 2-15. Installer's Local Test
(fig. 2-17)

*a.* Check the simultaneous signal circuit between the keyboard-transmitter and perforator as follows:

(1) Set the keyboard control switch to the TAPE position.

(2) Set the perforator control switch to the KEYBD position.

(3) Set the keyboard control lever (fig. 2-23) to the right (all models except TT-117/FG and TT-119/FG).

**NOTE**

Steps (4) and (5) below are not applicable to AN/FGC-161 and AN/FGC-162.

(4) Set the line switch key to the TEST position.

(5) Set the ALR MONITOR switch to the OFF position.

(6) Send alternate R and Y code combinations until about 36 inches of tape have been cut in this manner. Do not use the manual carriage return. The carriage should automatically return after the 72d character has been struck (76th character on

TT-118/FG). The end-of-line indicator lamp should light when the 66th character is struck (70th character on TT-118/FG). Check the printed and punched tape to make sure that the printing and code punches are sharp and correct. Save the tape for later tests.

(7) Send the following test message five times in rapid succession: THE QUICK BROWN FOX JUMPED OVER THE LAZY DOG'S BACK 1234567890-$!&'( )"/:;?,. Depress the CAR. RET. and LINE FEED keys after each test message. The carriage indicator should return to the left margin each time. Check the perforated tape for accuracy. Save the tape for later tests.

(8) Depress the FIGS key and then the S (BELL) key. The perforator signal bell should ring.

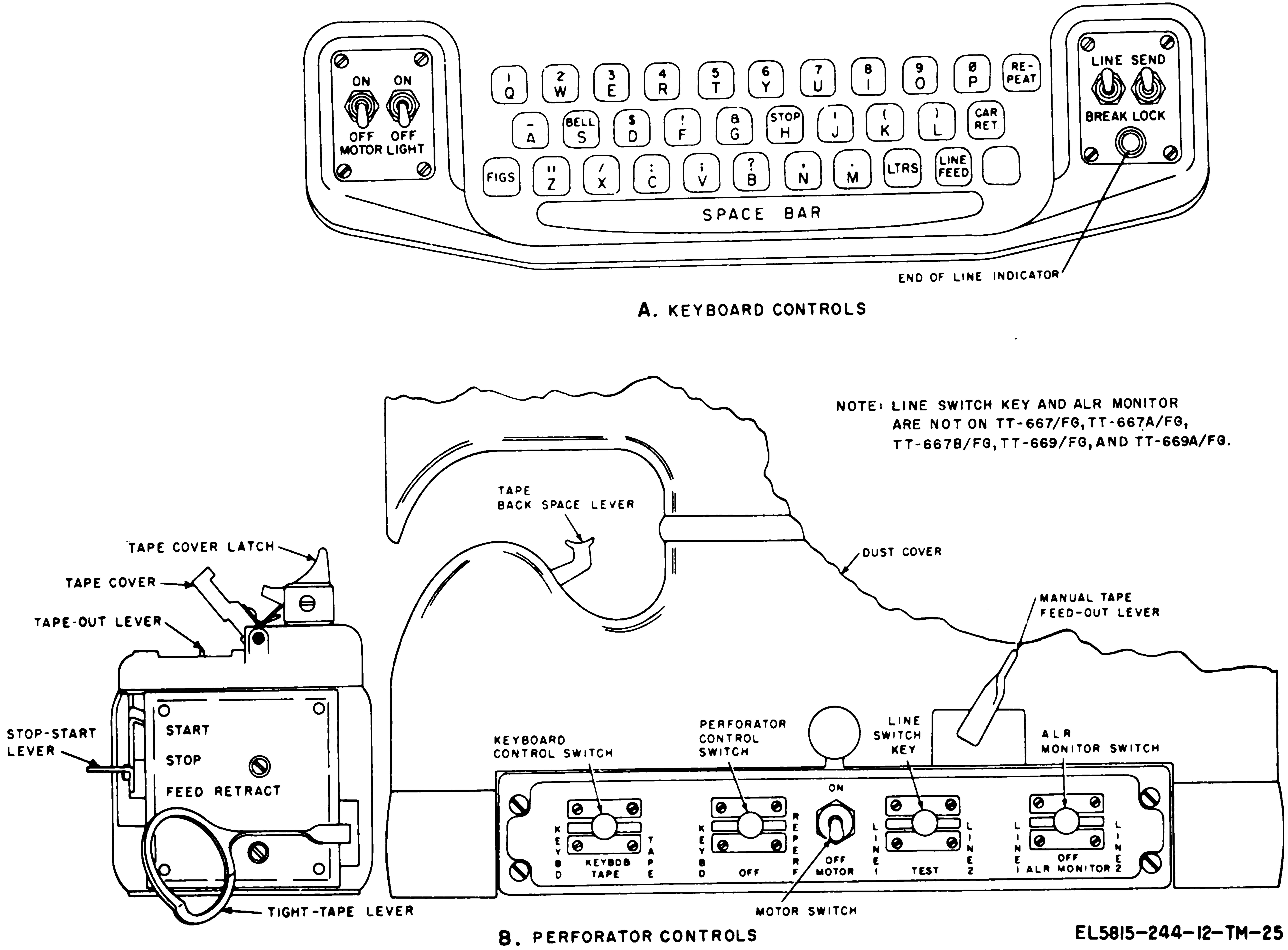

*Figure 2-20. Keyboard and perforator controls.*

*b*. Check the transmitter-distributor as follows:

(1) Insert the test message tape into the transmitter-distributor as described in *c* (6) below.

(2) Move the STOP-START lever to the FEED RETRACT position. The tape should move freely forward or backwards with light hand pressure.

(3) Move the STOP-START lever to the START position. The tape should feed steadily into the mechanism without bind.

(4) Move the STOP-START lever to the STOP position. The tape should cease to feed into the machine immediately.

(5) Move the STOP-START lever to the START position.

(6) Lift the tight-tape lever. The tape should cease to feed immediately. Release the tight-tape lever.

(7) Operate the tape cover latch to release the tape cover. The tape should cease to feed instantly.

(8) Close the tape cover and reinsert the tape if necessary.

(9) Allow the end of the tape to feed into the mechanism. The mechanism should cease to run as soon as the end of the tape feeds under the cover.

(10) Check the spent tape after it passes through the transmitter-distributor. It should be smooth and flat, and the code and feed holes should be sharp and free of distortion.

*c*. Set the rangefinders as follows:

(1) Set the keyboard SEND-LOCK switch in the LOCK position.

(2) Set the keyboard control switch in the KEYBD position.

(3) Set the perforator control switch in the KEYBD position.

NOTE

Steps (4) and (5) below are not applicable to AN/FGC-161 and AN/FGC-162.

(4) Set the line switch key in the TEST position.

(5) Set the ALR MONITOR switch in the OFF position.

(6) Install the tape cut during the procedure described in *a* (6) above in the transmitter-distributor. Be sure that the printed portion of the tape is toward the outer edge of the machine, and that the tape is properly threaded through the tight-tape lever. Close the tape cover.

(7) Move the STOP-START lever to the START position; the tape should start feeding into the transmitter-distributor.

(8) The alternate R and Y message should be printed on the page printing mechanism. Turn the rangefinder dial on the page printer (fig. 2-21) to the maximum and minimum positions between which good copy is received. Note the readings at each position; then set the rangefinder dial in a position midway between these points.

(9) Set the perforator control switch in the REPERF position.

(10) Similarly set the perforator rangefinder (fig. 2-22). Loosen the knurled nut before setting the adjustment, and tighten it when the adjustment is made.

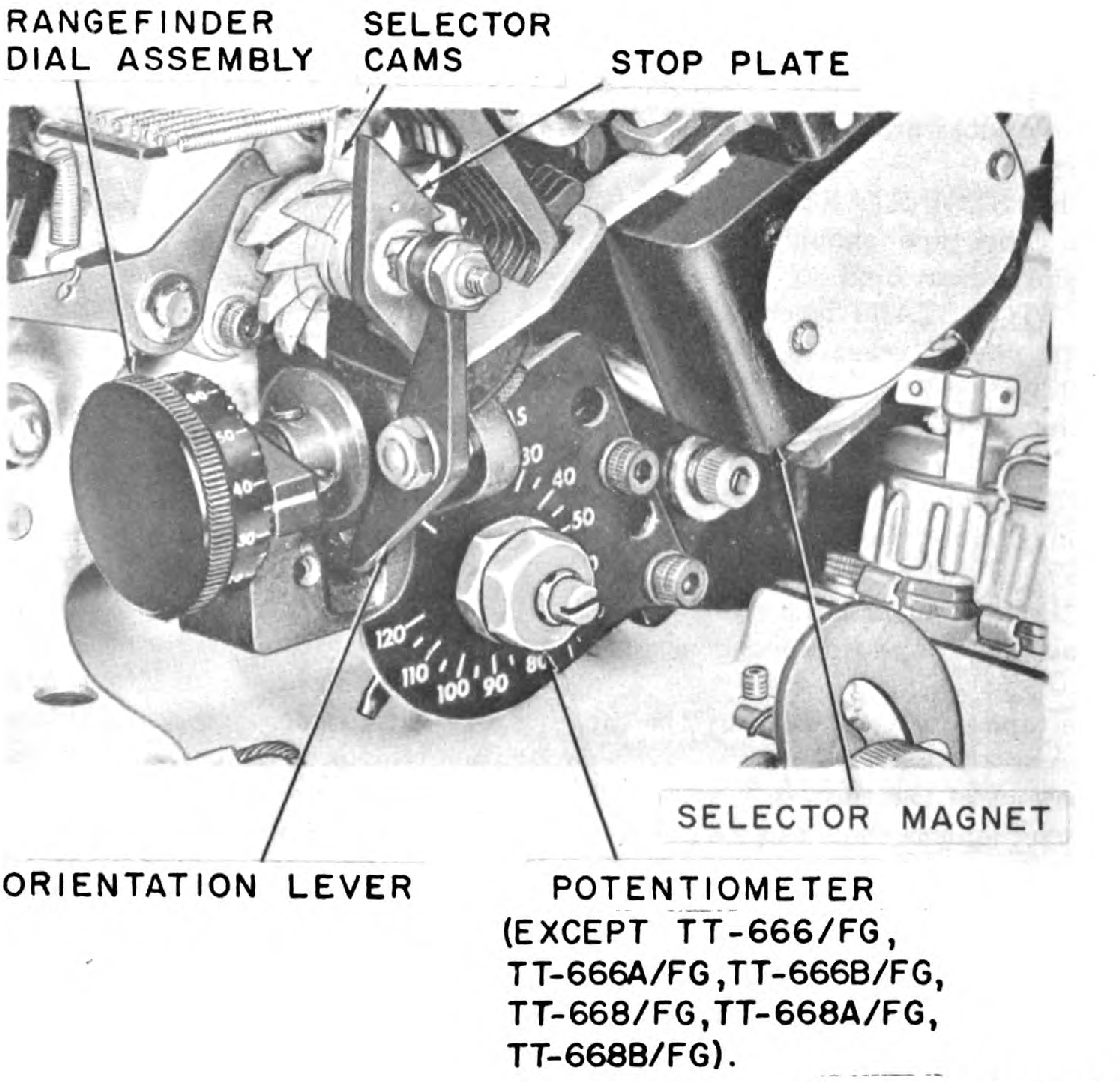
RANGEFINDER DIAL ASSEMBLY
SELECTOR CAMS
STOP PLATE
SELECTOR MAGNET
ORIENTATION LEVER
POTENTIOMETER (EXCEPT TT-666/FG, TT-666A/FG,TT-666B/FG, TT-668/FG,TT-668A/FG, TT-668B/FG).
EL5815-244-12-TM-26

*Figure 2-21. Page printer rangefinder mechanism.*

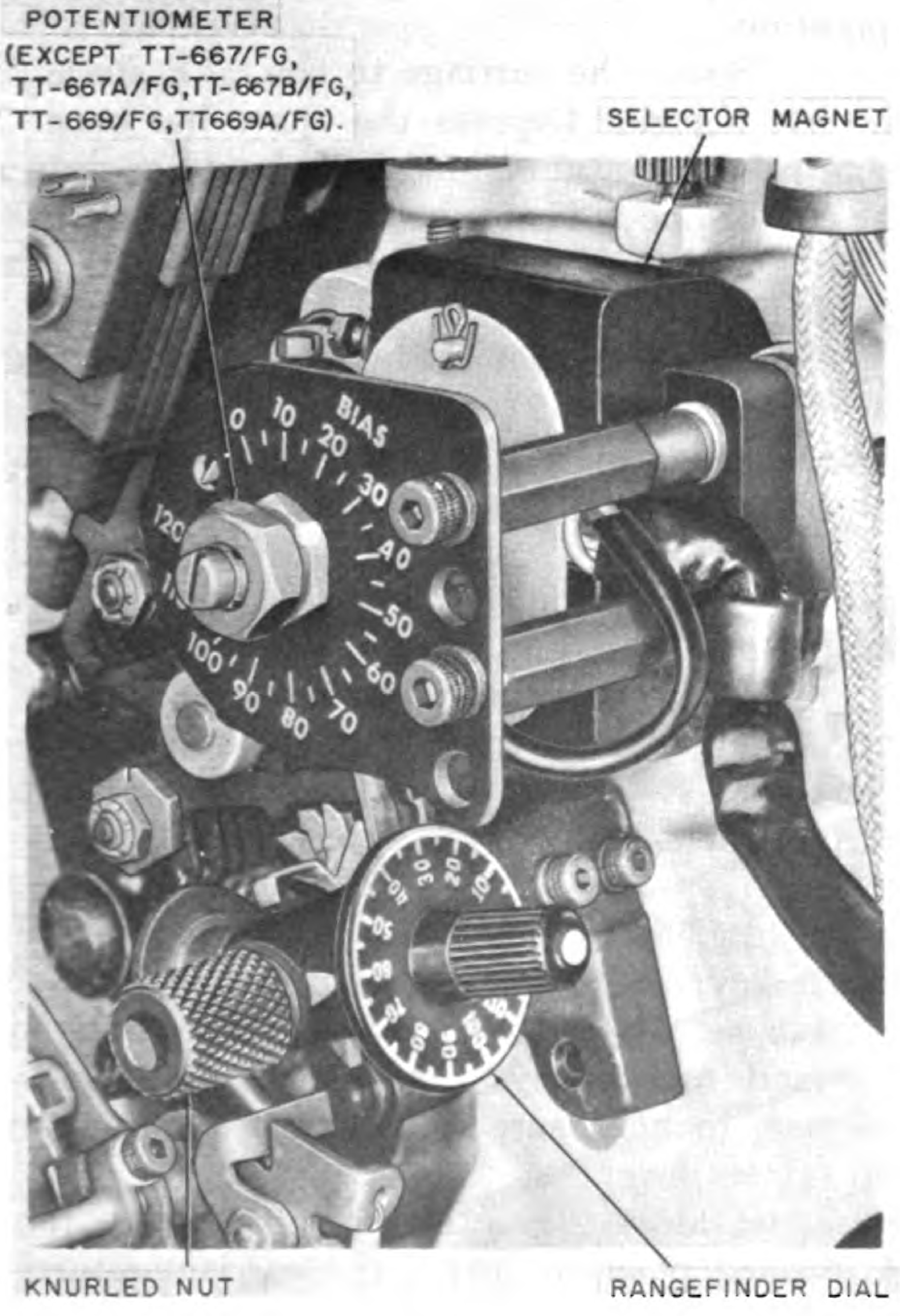

*Figure 2-22. Perforator rangefinder mechanism.*

*d.* Check the automatic line feed and carriage-return. The automatic line feed and carriage-return should operate after the printing of the 72d (76th on TT-118/FG) character on a line. Since it takes approximately as long for the carriage to return as it does for three consecutive code groups to be received, letters will be printed while the carriage is returning. One letter will be printed two-thirds of the way from the left margin, another will be printed one-third of the way from the left margin, and the third will print in the first space at the left margin. This condition occurs whenever copy is received during automatic carriage-return and line feed.

*e.* With the switches set as directed in *c* above, insert the test message tape in the transmitter-distributor. Check as follows:

(1) Move the STOP-START lever to the START position. A page copy of the test message should be printed by the page printing mechanism, and a printed and punched tape copy should be made by the perforator. Check the accuracy of the message.

(2) Check the page copy for proper carriage-return and line feed. At the end of each message line, the carriage should return and the paper should feed. Move the line feed lever to the single and then to the double line feed positions. The forward position is single line feed and the double line feed position is to the rear.

*f.* Check transmission of sequential signals from the keyboard-transmitter as follows:

(1) See that the keyboard control switch in the KEYBD position.

(2) See that the perforator control switch is in the REPERF position.

(3) See that the keyboard control lever (fig. 2-23) is to the left on all models except TT-117/FG and TT-119/FG.

NOTE

Setps (4) and (5) below are not applicable to AN/FGC-161 and AN/FGC-162.

(4) See that the line switch key is in the TEST position.

(5) See that the ALR MONITOR switch is in the OFF position.

(6) Send the test message (*a* (7) above) five times in rapid succession from the keyboard. A page copy of the test message should be printed by the page printing mechanism, and a printed and punched tape copy should be made by the perforator. Check both copies for accuracy and clarity of printing. Check the perforator copy for correct punching.

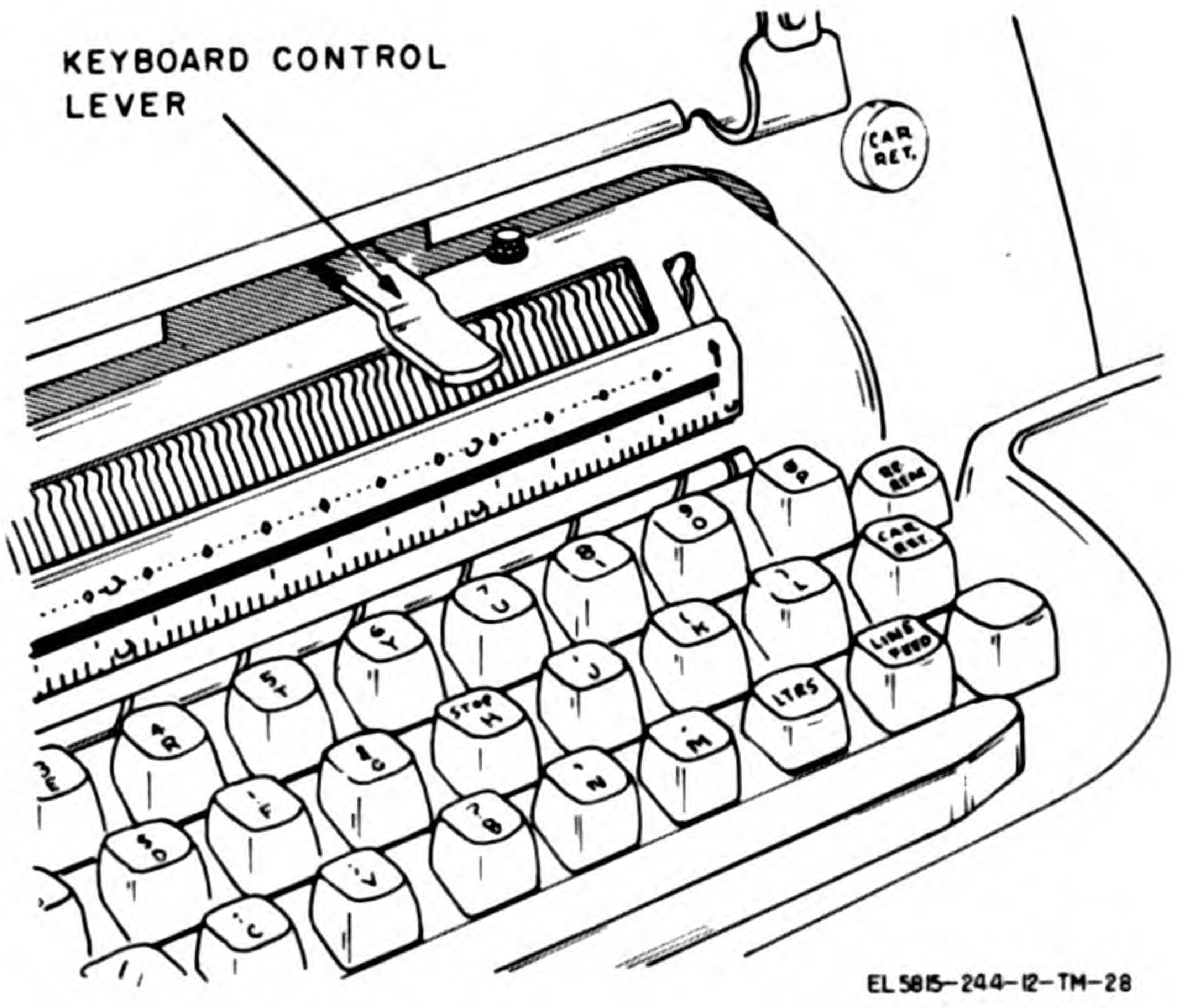

*Figure 2-23. Keyboard control lever (all model except TT-117/FG, TT-119/FG, and TT-666/FG ).*

*g.* Check the page printer signal bell as follows:

(1) Turn the perforator MOTOR switch to the OFF position.

(2) Depress the FIGS and then the S (BELL) keys. The page printer signal bell should ring.

(3) Return the perforator MOTOR switch to ON.

*h.* Check the motor stop operation as follows:

NOTE

Not applicable to AN/FGC-161 and AN/FGC-162.

(1) Depress the FIGS and then the H (STOP) key levers. The page printer motor should stop. On TT-118/FG, depress FIGS, BLANK, and H, in sequence to achieve the same result.

(2) Operate the LINE-BREAK switch to the BREAK position and release it. The page printer motor should start.

NOTE

The perforator motor does not have the motor stop feature, and must be shut off with the MOTOR switch.

*i.* Make the following additional tests:

(1) Depress the FIGS key lever to shift the platen to the upper case position. Press the LTRS button on the left side of the page printer dust cover. The platen should shift to the lower case position.

(2) Space the carriage to the midpoint of the page printer and press the CAR. RET. button on the right side of the dust cover. The carriage should return to the left side of the page printer.

(3) With the carriage at the left position of the page printer, press the manual space pushbutton located behind the right side of the platen. The carriage should move toward the right of the machine. Carriage movement should stop when the button is released.

(4) With the switches set as described in *f* above, type on the keyboard to check the movement of the perforator and page printer inking ribbons. The perforator inking ribbon should move once for every two operations; the page printer inking ribbon should move with every operation.

(5) Space the carriage to the 65th space from the left margin. Depress the space bar once. The page printer margin signal bell should operate and the end-of-line indicator lamp should light.

(6) Check the operation of the tabulator mechanism as follows:

(a) Press down on the tab crank arm (fig. 2-21) at the left of the tabulator and, with a pencil or other suitable instrument, pull down all of the red tab set levers. Release the tab crank arm.

(b) Move the tabulator locking lever at the right of the tabulator mechanism to its upward position.

(c) Depress and hold the space bar and the repeat key. The indicator carriage should move to the right, stopping at the first red tab set lever from the left. Release the space bar and the repeat key.

(d) Depress and hold the space bar and the repeat key; the carriage should stop at the second red tab set lever from the left. Release the space bar and repeat key. Continue to check in this manner, making sure the carriage stops at every red tab set lever.

(e) Move the tab locking lever to the downward position. Press the carriage-return key to cause the carriage to move to the left side of the page printer. Depress and hold the space bar and the repeat key. The carriage should move all of the way to the right side of the page printer without stopping at any of the tab set levers.

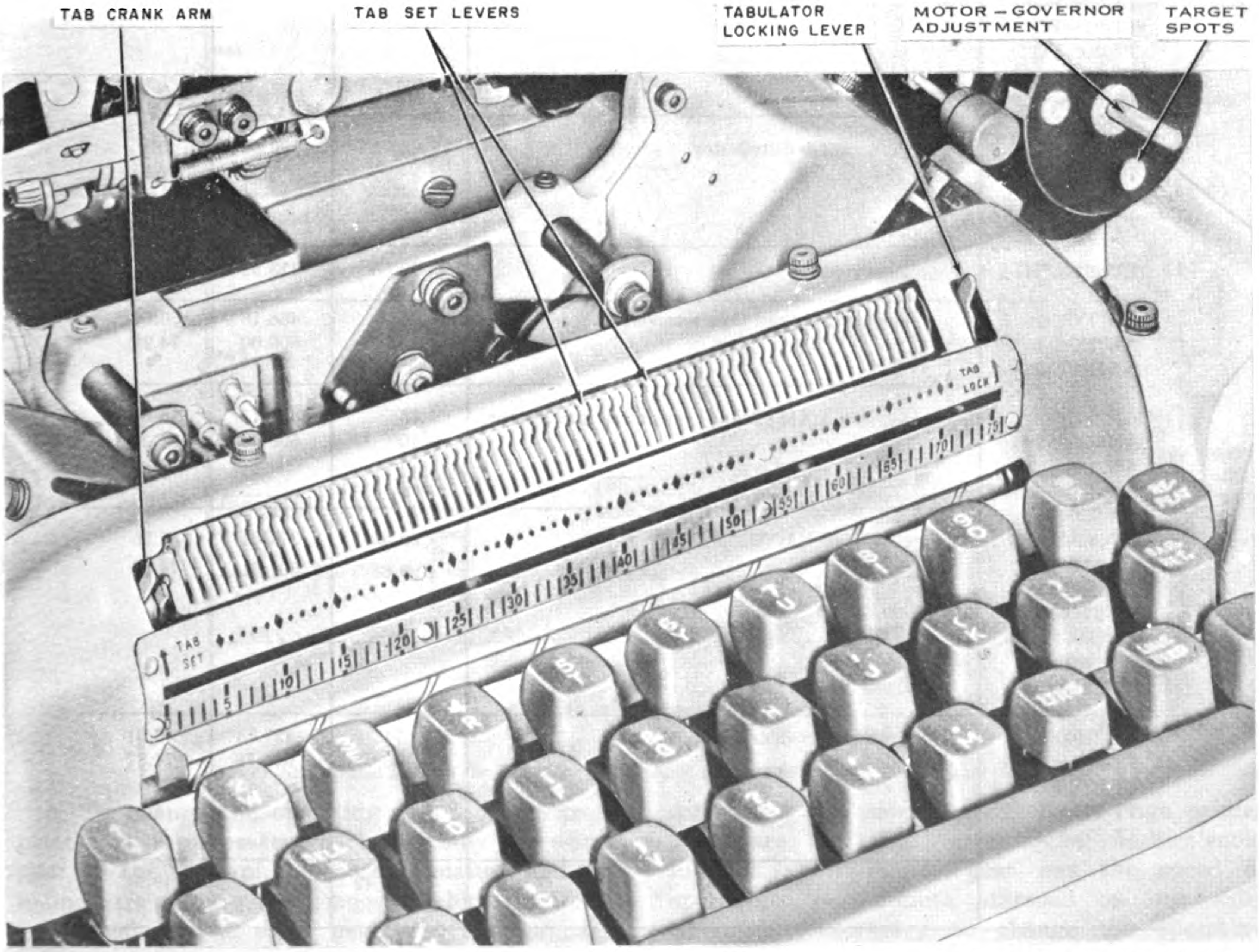

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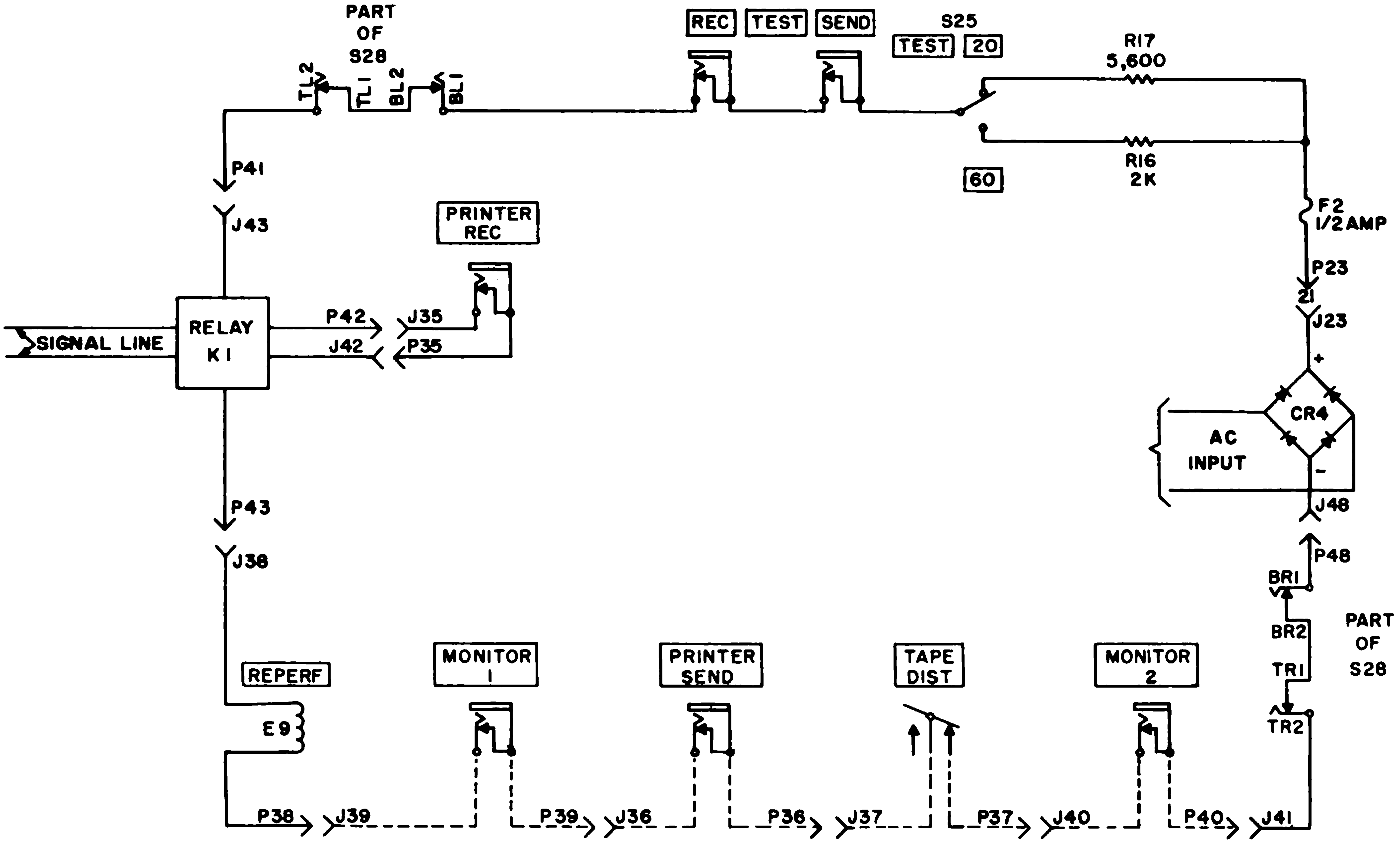
*Figure 2-24. Tabulator assembly.*

### 2-16. Changing Teletypewriter Operating Speed

*a.* The equipment is shipped with gearsets for 368.1 operations per minute (opm), 60 words per minute (wpm) installed. Gears also are provided for speed changes to 460 opm (75 wpm) and 600 opm (100 wpm). The following charts show the relationship between words per minute (wpm), operations per minute (opm), and baud modulation rate.

| Equipment | | Speeds | | |
|---|---|---|---|---|
| | | Wpm | Opm | Actual baud |
| AN/FGC-25<br>AN/FGC-25X<br>AN/FGC-26<br>AN/FGC-57<br>AN/FGC-26X<br>AN/UGC-30<br>AN/UGC-30X | Page printer and tape receiver. | 61.76 | 370.59 | 45.83 |
| | Keyboard XMTR and transmitter-distributor. | 61.54 | 369.23 | 45.66 |

| Equipment | | Speeds | | |
|---|---|---|---|---|
| | | Wpm | Opm | Actual baud |
| TT-269A/FG<br>TT-271A/FG<br>TT-269/FG<br>TT-271/FG<br>TT-396/FG<br>TT-269B/FG<br>TT-271B/FG | Keyboard XMTR | 56.93 | 341.56 | 45.54 |
| TT-270/FG<br>TT-272/FG<br>TT-397/FG<br>TT-270A/FG | Transmitter-distributor. | 65.01 | 390.09 | 45.51 |
| TT-272A/FG | Tape receiver | 70.58 | 423.52 | |
| AN/FGC-25<br>AN/FGC-25X<br>AN/FGC-26 | Page printer and tape receiver. | 75<br>100 | 458.18<br>600.00 | 56.66<br>74.20 |
| AN/FGC-57<br>AN/FGC-26X<br>AN/UGC-30<br>AN/UGC-30X | Keyboard XMTR and transmitter-distributor. | 75<br>100 | 459.77<br>600.00 | 56.86<br>72.20 |
| TT-269/FG<br>TT-271/FG<br>TT-269A/FG<br>TT-271A/FG<br>TT-396/FG<br>TT-269B/FG<br>TT-271B/FG | Keyboard XMTR | 62.43<br>93.65 | 374.61<br>561.91 | 49.95<br>74.92 |
| TT-270/FG<br>TT-272/FG<br>TT-397/FG<br>TT-270A/FG<br>TT-272A/FG | Transmitter-distributor. | 71.31<br>106.96 | 427.84<br>641.76 | 49.91<br>74.87 |
| | Tape receiver | 77.42<br>116.13 | 464.52<br>696.78 | 49.91<br>74.87 |



NOTE:
S28 IN TEST POSITION.

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*Figure 2-25. Basic pattern for alternate patch panel arrangements using automatic line return.*

*b.* To change the operating speed of the page printer, it is necessary to change only the worm gear on the shaft of the motor armature and the main shaft worm wheel gear with which the worm gear meshes. The extra gear sets for the page printer are mounted on the worm gear cover plate and beneath the paper roller stand. The speed, in operations per minute, is stamped on the sides of the main shaft worm wheel gears and on the cylindrical portions of the worm gears. Check both gears to make sure they are correct for the operating speed desired.

*c.* To change the operating speed of the perforator, it is necessary to change to worm gear on the shaft of the motor armature and the worm wheel on the perforator main shaft. It is also necessary to check that the double gear for the speed desired is installed on the receiving multisolenoid function shaft, and that the idler gear engages the correct surface of the double gear. The 600 opm and 460 opm gears are mounted on the perforator base along with a 460- 600-opm (75 to 100 wpm) receiving multisolenoid function shaft double gear. The gears of the perforator are marked in the same way that the page printer gears are marked. The receiving multisolenoid function shaft double gear has the speed in operations per minute stamped on one side. Operations necessary to change the operating speed of the page printer are listed in *d* below. Operations necessary to change the operating speed of the perforator are listed in *e* below.

NOTE

The gears for 404 opm (66 wpm) are not supplied with the equipment. If the need arises the gears must be procured separately.

*d.* To change the page printer operating speed use the charts in *e* below to determine which worm gear and worm wheel should be used for the desired operating speed. Remove the worm gear as instructed. Remove the old worm wheel and install the new worm wheel as instructed. Install the new worm gear as instructed.

*e.* To change the perforator operating speed, use the following charts to determine which gears are to be used to obtain the desired operating speed. For identification purposes, the receiver multisolenoid function shaft double gears have the operating speeds stamped on the side opposite the clutch teeth. If these stampings are not legible, the double gears can be identified by measuring the outside diameters or by counting the number of teeth on each gear. The 368.1- to 460-opm double gear has outside diameters of 1¼ and 1½ inches and has 27 and 33 gear teeth. The 460- to 600-opm double gear has outside diameters of 1½ and 1-7/8 inches and has 33 and 43 gear teeth. Follow the procedure outlined in *f* through *t* below if it is necessary to change gears.

(1) The following chart lists the gears of all perforators except those used in the AN/UGC-30, AN/UGC-30X, AN/FGC-52, AN/FGC-52X, and AN/FGC-68.

| Operating speed (wpm) | Worm gear | | Worm wheel | | Double gear | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Reference designation | |
| | Marking (opm) | Reference designation | Marking (opm) | Reference designation | In mesh with idler gear | Marking (opm) | TT-178 FG and TT-179 FG | All other models |
| 60 | 368.1 | 50350 | 368.1 | 50352A | Small portion | 368.1-460 | 56128A | 59878A |
| 66 | 404 | 50351 | 404 | 50353A | Small portion | 368.1-460 | | |
| 75 | 460 | 52366 | 460 | 52348A | Large portion | 368.1-460 | | |
| | | | | | or | | | |
| | | | | | Small portion | 460-600 | 56105A | 60196A |
| 100 | 600 | 50596 | 600 | 50597A | Large portion | 460-600 | | |

(2) The following chart lists the gears used in the perforators of the AN/UGC-30, AN/UGC-30X, AN/FGC-52, AN/FGC-52X, and AN/FGC-68.

| Operating speed (baud) | Worm gear marking | Main shaft driven gear marking | Idler gear marking | Double gear marking |
|---|---|---|---|---|
| 45.5 | R-368.2 or 45.5 baud | R-368.2 or 45.5 baud | Small portion | 368.1-460 opm |
| 50.0 | R404 or 50.0 baud | R-404 or 50.0 baud | Small portion | 368.1-460 opm |
| 75.0 | 75B | 75B | Large portion | 460-600 opm |

NOTE

The idler gear and double gear changes are required to keep the speed of the receiving multisolenoid function shaft at 125 wpm.

(3) The following chart lists the gears used in the page printers of the AN/UGC-30, AN/UGC-30X, AN/FGC-52, AN/FGC-52X, and AN/FGC-68.

| *Operating speed (baud)* | *Worm gear marking* | *Main shaft driven gear marking* |
|---|---|---|
| 45.5 | R-368.2 or 45.5B | 386.2 or 45.5 baud |
| 50.0 | R-404 or 50.0 baud | R-404 or 50.0 baud |
| 75.0 | 75B | 75B |

*f.* Remove the perforator chassis.

*g.* Remove the perforator motor.

*h.* Remove the worm gear from the motor armature shaft.

*i.* Install the correct worm gear on the motor armature shaft.

*j.* Remove the perforator main shaft worm wheel gear.

*k.* Install the correct perforator main shaft worm wheel gear.

*l.* Replace the perforator motor.

*m.* Remove the pulsing contact assembly.

*n.* Loosen the two screws that hold the idler gear bracket to the perforator frame.

*o.* If only a change of position is required by the chart for the new operating speed, remove the idler gear and interchange its position with that of the spacer, and proceed to *q* below to complete the change.

*p.* If a change of the double gear is required by the chart for the new operating speed, proceed as follows:

(1) Loosen the machine screw that holds the shaft collar to the transfer lever shaft and remove the shaft collar.

(2) Loosen the function clutch latch screw so that the clutch latch arm is loose on the transfer lever shaft.

(3) Remove the double gear from the receiving multisolenoid function shaft.

(4) If applicable, remove the ball bearings and retainer rings from the double gear that was in use, and place them in the double gear to be installed.

(5) Reassemble components on the receiving multisolenoid function shaft and adjust the clutch latch arm.

(6) Replace the shaft collar and adjust.

*q.* Tighten the two screws that hold the idler gear bracket to the perforator. Recheck to be sure that the idler gear meshes with the correct surface of the double gear as required by the chart.

*r.* Replace the pulsing contact assembly.

*s.* Replace the tape receiver chassis.

*t.* Adjust the clutch latch arm.

## Section IV. INSTALLATION AND LINEUP

### 2-17. General

The teletypewriter set may be installed to meet a variety of operational requirements. This variety of operational possibilities is achieved by the use of the patch panel (fig. 2-26 or 2-27) and by varying the connections of the signal lines into the unit. Varying the setup of the patch panel changes the circuits through the teletypewriter set thus changing the operation of the unit. Fifteen typical patch panel conditions are described in paragraph 3-4. These conditions are designated as condition A, condition B, condition C, etc. in the subsequent text for ease of identification. The patch panel plugs may be easily inserted or removed by pressing inward on the cord with the thumb and grasping the bakelite section of the plug with two fingers. After the patch panel has been set up, the operator can further control the operation of the equipment by means of the switches on the front panels (fig. 2-20). Detailed switch settings for each of the typical patch panel conditions described are given in chart form in paragraph 3-5.

### 2-18. Typical Patch Panel Connections

The patch panel condition used for installation testing is described in paragraph 2-13. Other typical patch panel conditions are described in *a* through *o* below. Figure 2-14 is a simplified diagram showing how units of the teletypewriter set are connected in series with each other and with the distant station. A block diagram of the equipment in each condition is furnished to aid in visualizing the operation of the unit. In addition to the illustration, a connection chart is provided for all of the patch panel conditions.

*a. Patch Panel Condition A.* Patch panel condition A (fig. 2-14) is used for testing the equipment, or for half-duplex operation of all of the equipment on line 1 or line 2. The automatic line return provision permits the page printer to monitor the local keyboard during tape perforation without disturbing the signal line, or to make a page copy of a tape being sent through the transmitter-distributor. The page printer will automatically return to the line at the start of an incoming message. Connections necessary to set up condition A are given in (1) and (2) below.

(1) *TT-178/FG and TT-179/FG* (fig. 2-26).

| Patch panel plugs | | Patch panel condition | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
| PRINTER REC | P35 | J42 | J38 | J39 | J46 | J38 | J46 | J42 | J38 | J42 | J42 | J46 | J47 | J46 | J44 | J46 |
| PRINTER SEND | P36 | J37 | J44 | J40 | J44 | J45 | J37 | J41 | J40 | J41 | J38 | J39 | J40 | J37 | J39 | J40 |
| TAPE DIST | P37 | J40 | J45 | J38 | J45 | J44 | J41 | J40 | J39 | J40 | J41 | J40 | J39 | J41 | J40 | J39 |
| REPERF | P38 | J39 | J36 | J44 | J35 | J47 | J36 | J39 | J46 | J45 | J45 | J47 | J46 | J47 | J46 | J44 |
| MONITOR 1 | P39 | J36 | J39 | J37 | J39 | J39 | J44 | J36 | J44 | J36 | J43 | J44 | J44 | J44 | J35 | J38 |
| MONITOR 2 | P40 | J41 | J40 | J45 | J40 | J40 | J45 | J45 | J45 | J38 | J36 | J45 | J45 | J45 | J45 | J45 |
| LINE TEST | P41 | J43 | J41 | J41 | J41 | J41 | J38 | J43 | J41 | J43 | J39 | J41 | J41 | J36 | J41 | J41 |
| AUTO LINE RET IN | P42 | J35 | J42 | J42 | J42 | J42 | J42 | J35 | J42 | J35 | J35 | J42 | J42 | J42 | J42 | J42 |
| AUTO LINE RET OUT | P43 | J38 | J43 | J43 | J43 | J43 | J43 | J38 | J43 | J39 | J37 | J43 | J43 | J43 | J43 | J43 |
| LINE 1 | P44 | J44 | J35 | J35 | J36 | J37 | J39 | J44 | J37 | J44 | J44 | J36 | J37 | J39 | J36 | J37 |
| LINE 2 | P45 | J45 | J37 | J36 | J37 | J36 | J40 | J37 | J36 | J37 | J40 | J37 | J36 | J40 | J37 | J36 |
| LINE 3 | P46 | J46 | J46 | J46 | J38 | J46 | J35 | J46 | J35 | J46 | J46 | J35 | J38 | J35 | J38 | J35 |
| LINE 4 | P47 | J47 | J47 | J47 | J47 | J35 | J47 | J47 | J47 | J47 | J47 | J38 | J35 | J38 | J47 | J47 |
| D.C. TEST | P48 | J48 | J48 | J48 | J48 | J48 | J48 | J48 | J48 | J48 | J48 | J48 | J48 | J48 | J48 | J48 |

**NOTE**

To set up any condition on the patch panel: Patch the plug indicated in the extreme left-hand column into the jack indicated under the condition desired. For example, to set up condition B, PRINTER-REC plug P35 would be inserted into jack J38 and PRINTER-SEND plug P36 would be inserted into jack J44, etc.

(2) *All models except TT-178/FG and TT-179/FG* (fig. 2-27).

| Patch panel plugs | | Patch panel condition | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O |
| PRINTER REC | P203 | J212 | J214 | J206 | J202 | J214 | J202 | J212 | J214 | J212 | J212 | J202 | J201 | J202 | J207 | J202 |
| PRINTER SEND | P204 | J213 | J207 | J205 | J207 | J208 | J213 | J209 | J205 | J209 | J214 | J206 | J205 | J213 | J206 | J205 |
| TAPE DIST | P213 | J205 | J208 | J214 | J208 | J207 | J209 | J205 | J206 | J205 | J209 | J205 | J206 | J209 | J205 | J206 |
| REPERF | P214 | J206 | J204 | J207 | J203 | J201 | J204 | J206 | J202 | J208 | J208 | J201 | J202 | J201 | J202 | J207 |
| MONITOR 1 | P206 | J204 | J206 | J213 | J206 | J206 | J207 | J204 | J207 | J204 | J210 | J207 | J207 | J207 | J203 | J214 |
| MONITOR 2 | P205 | J209 | J205 | J208 | J205 | J205 | J208 | J208 | J208 | J214 | J204 | J208 | J208 | J208 | J208 | J208 |
| LINE TEST SW | P209 | J210 | J209 | J209 | J209 | J209 | J214 | J210 | J209 | J210 | J206 | J209 | J209 | J204 | J209 | J209 |
| AUTO LINE RET IN | P212 | J203 | J212 | J212 | J212 | J212 | J212 | J203 | J212 | J203 | J203 | J212 | J212 | J212 | J212 | J212 |
| AUTO LINE RET OUT | P210 | J214 | J210 | J210 | J210 | J210 | J210 | J214 | J210 | J206 | J213 | J210 | J210 | J210 | J210 | J210 |
| LINE 1 | P207 | J207 | J203 | J203 | J204 | J213 | J206 | J207 | J213 | J207 | J207 | J204 | J213 | J206 | J204 | J213 |
| LINE 2 | P208 | J208 | J213 | J204 | J213 | J204 | J205 | J213 | J204 | J213 | J205 | J213 | J204 | J205 | J213 | J204 |
| LINE 3 | P202 | J202 | J202 | J202 | J214 | J202 | J203 | J202 | J203 | J202 | J202 | J203 | J214 | J203 | J214 | J203 |
| LINE 4 | P201 | J201 | J201 | J201 | J201 | J203 | J201 | J201 | J201 | J201 | J201 | J214 | J203 | J214 | J201 | J201 |
| DC TEST | P211 | J211 | J211 | J211 | J211 | J211 | J211 | J211 | J211 | J211 | J211 | J211 | J211 | J211 | J211 | J211 |

NOTE

To set up any condition on the patch panel: Patch the plug indicated in the extreme left-hand column into the jack indicated under the condition desired. *For example,* to set up condition B, PRINTER REC, plug P203 would be inserted into jack J214 and PRINTER-SEND plug P204 would be inserted into jack J207, etc.

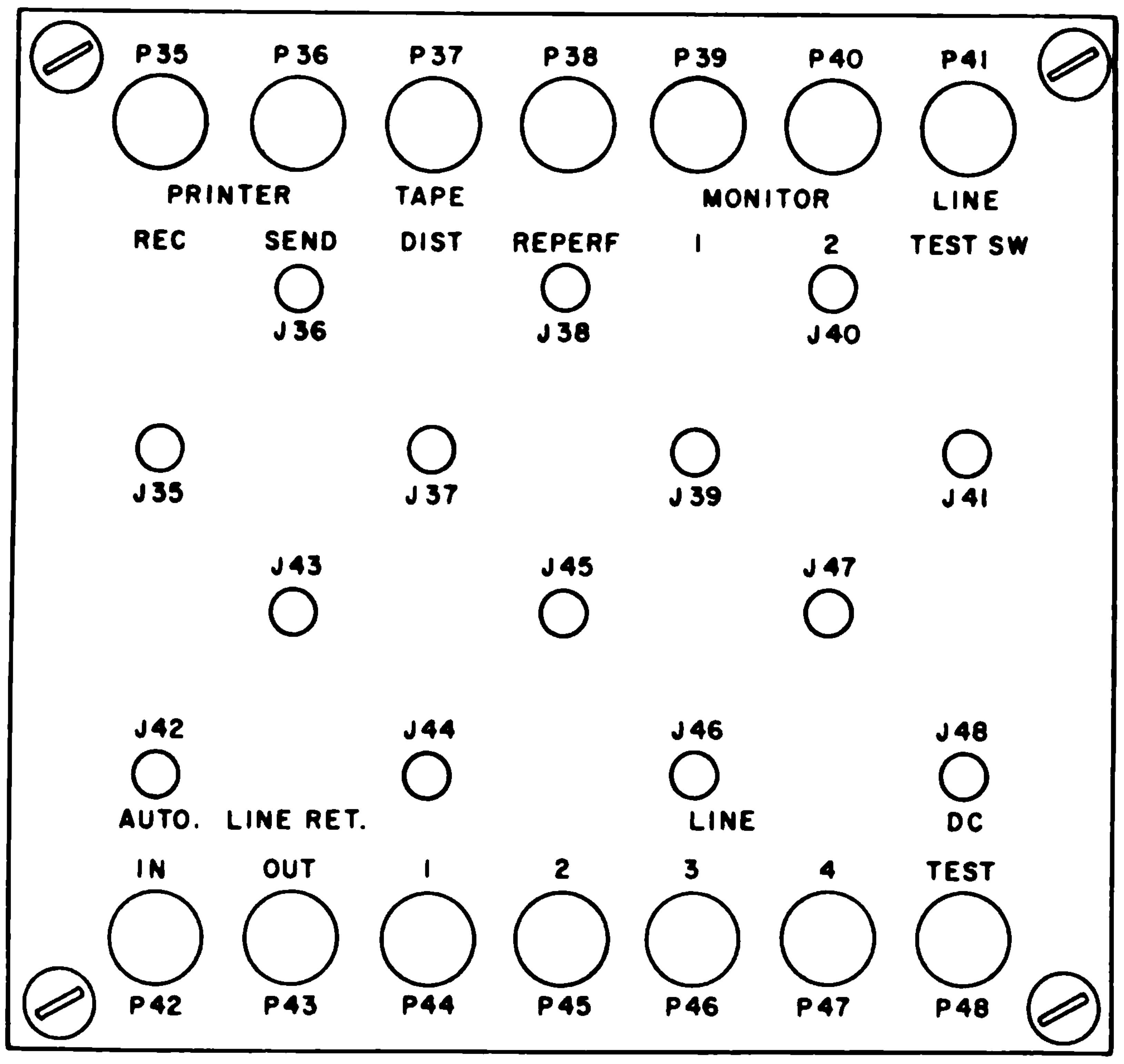


*Figure 2-26. Patch panel (TT-178/FG and TT-179/FG )*

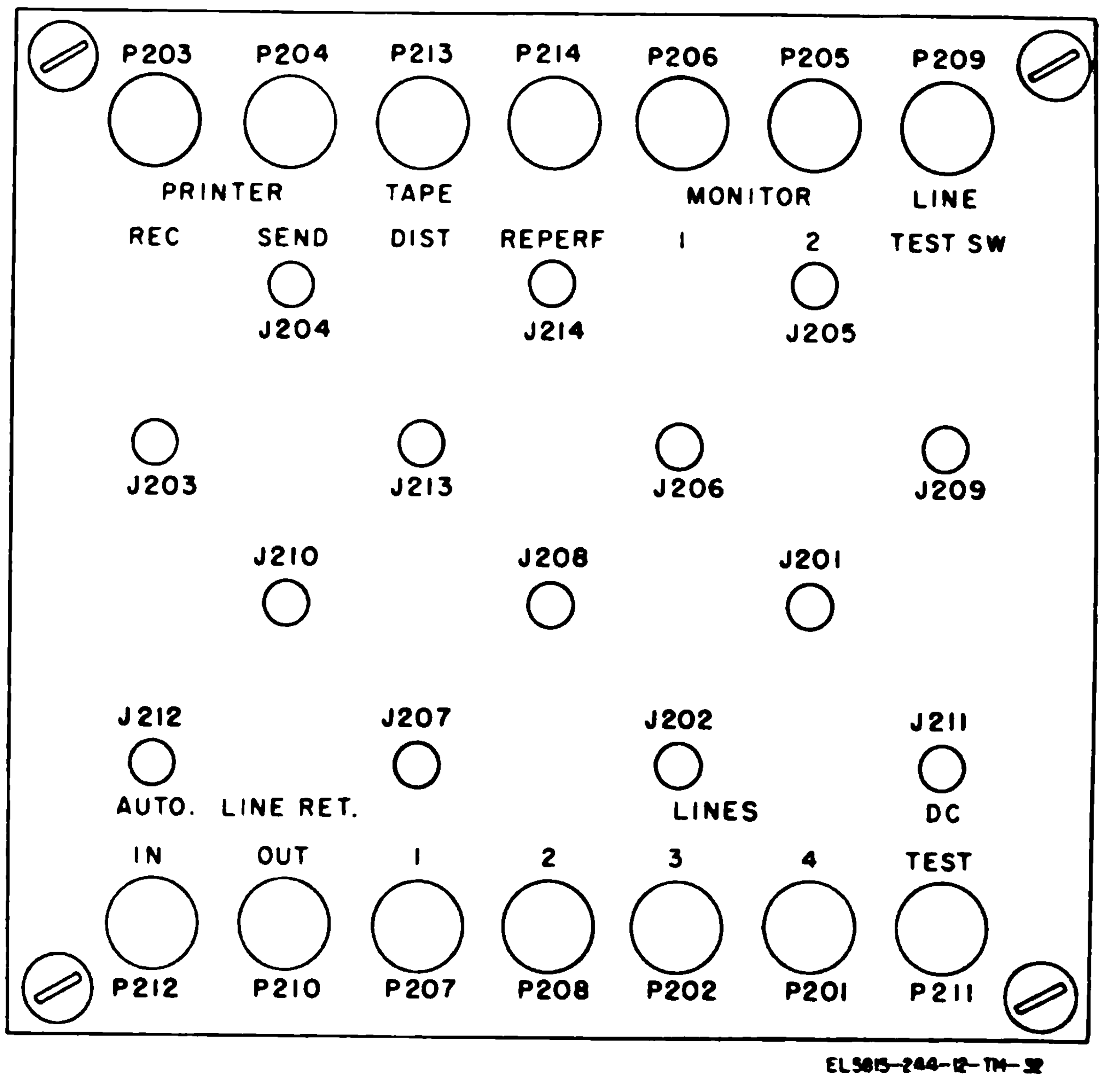


*Figure 2-27. Patch panel (all models except TT-178/FG and TT-179/FG).*

*b. Patch Panel Condition B.* Patch panel condition B (fig. 2-28) connects the page printing mechanism and the keyboard-transmitter in a half-duplex circuit on line 1 and the transmitter-distributor on a *send only* circuit on line 2. In this condition, tape may be perforated locally, or a tape may be made of the messages transmitted from the keyboard-transmitter. Connect the patch panel plugs to the jacks shown under B of the chart in *a* above.

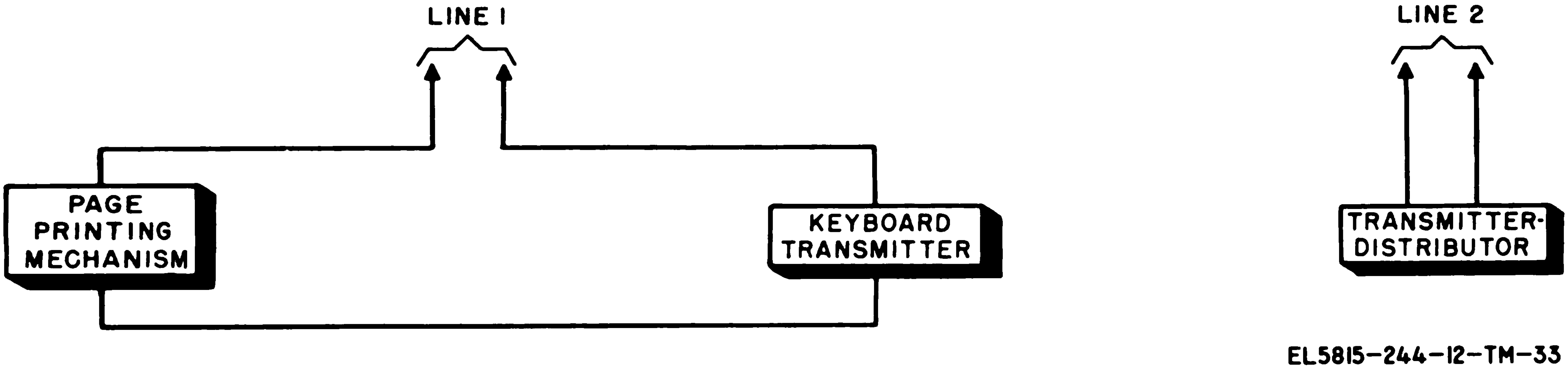


*Figure 2-28. Block diagram, condition B.*

*c. Patch Panel Condition C.* Patch panel condition C (fig. 2-29) connects the transmitter-distributor and the page printing mechanism in a half-duplex circuit on line 1 and the key-board-transmitter on line 2. Connections of the patch panel required to set up condition C are listed in *a* above.

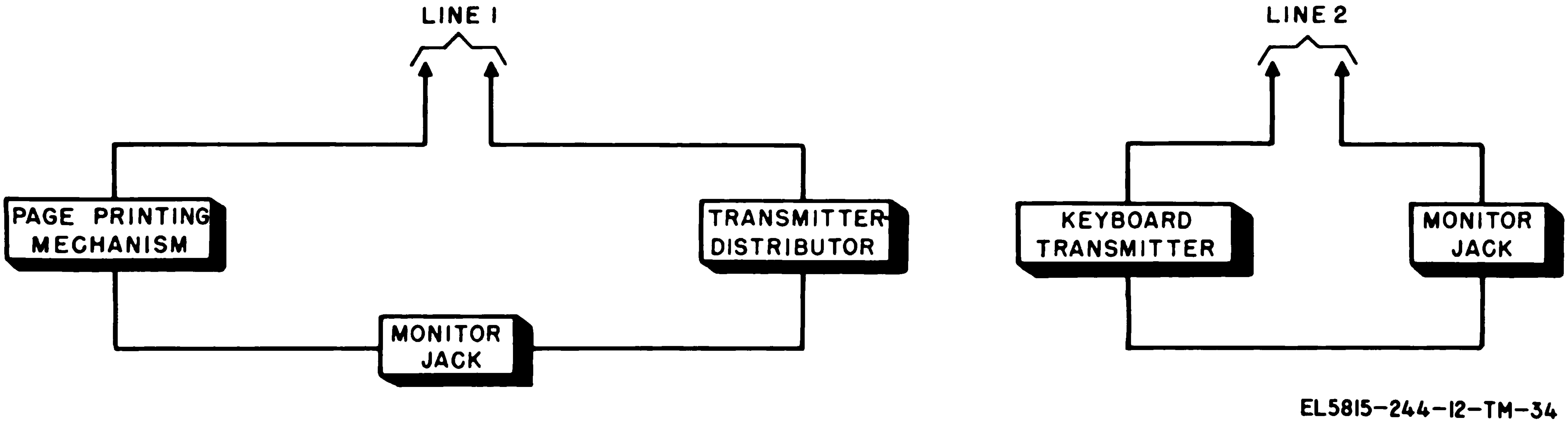


*Figure 2-29. Block diagram, condition C.*

*d. Patch Panel Condition D.* Patch panel condition D (fig. 2-30) is a full-duplex condition in which the keyboard-transmitter is connected to line 1, the transmitter-distributor is connected to line 2, and the page printing mechanism is connected to line 3. Connect the plugs of the patch panel to the jacks listed under D in the chart in *a* above.

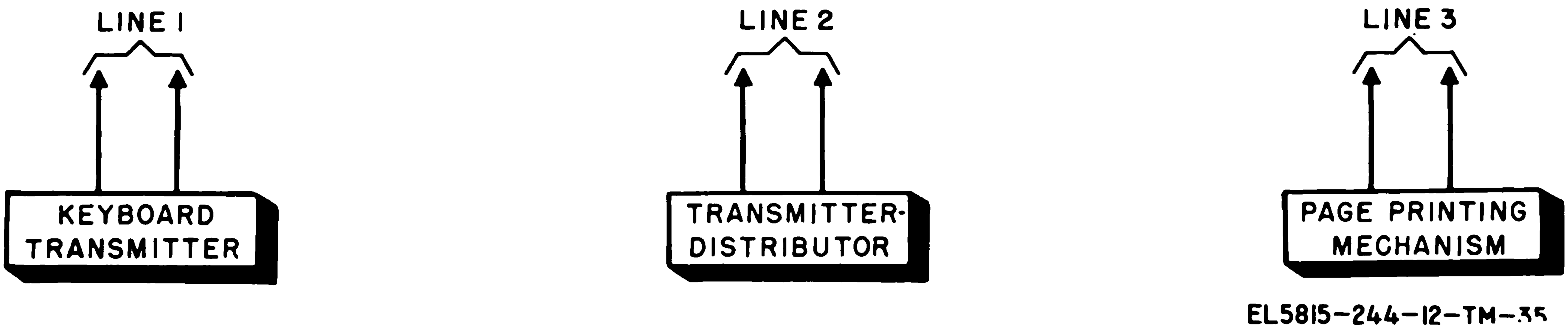
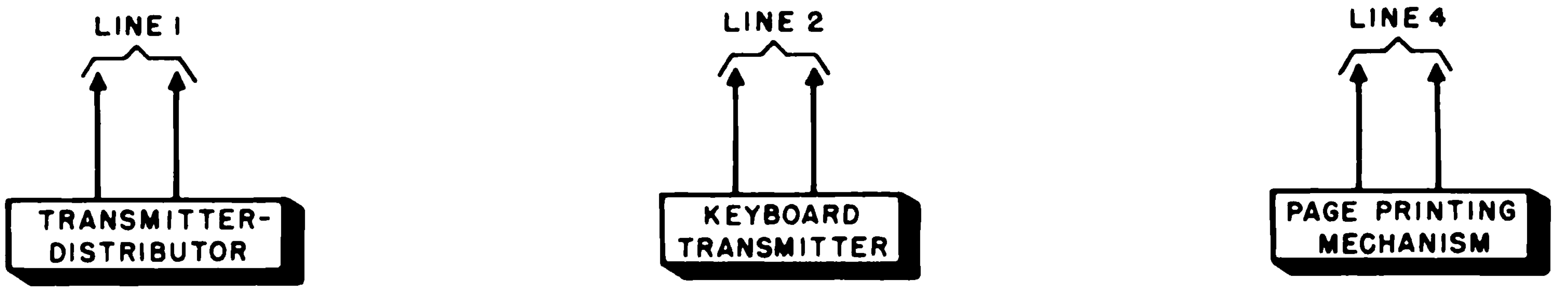


*Figure 2-30. Block diagram, condition D.*

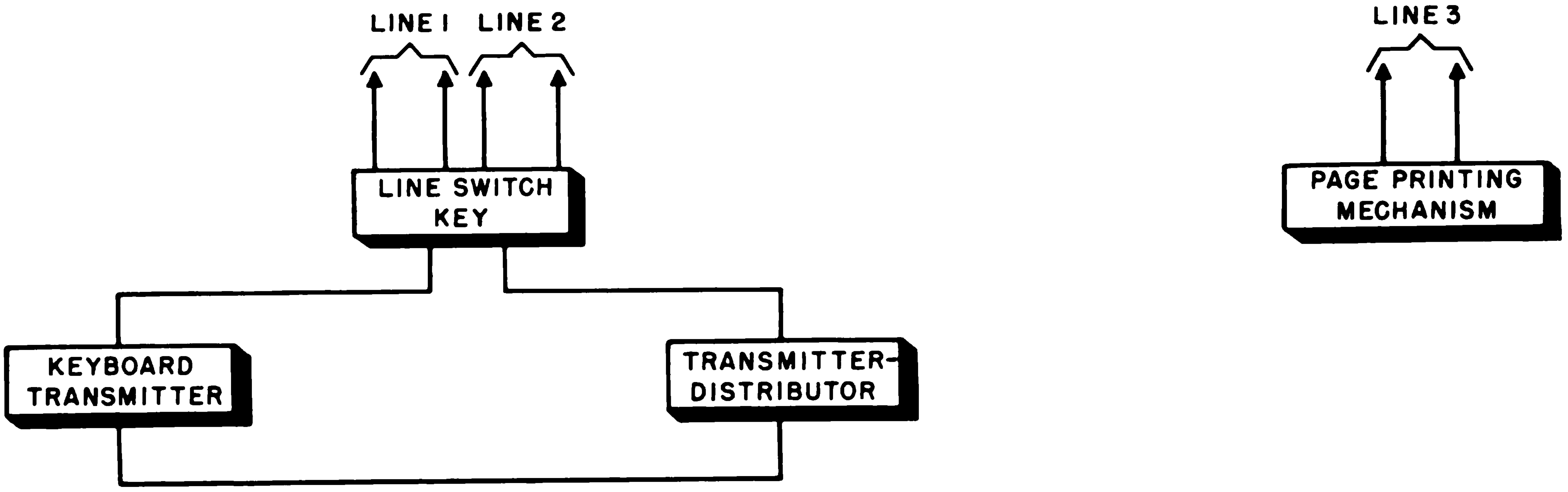
. *Patch Panel Condition E.* Patch panel condition E (fig. 2-31) is a full-duplex condition in which the transmitter-distributor is connected to line 1, the keyboard-transmitter is connected to line 2, and the page printing mechanism is connected to line 4. Connect the plugs to the jacks under column E of the chart in *a* above to set up condition E.



EL5815-244-12-TM-36

*Figure 2-31. Block diagram, condition E.*

*f. Patch Panel Condition F.* Patch panel condition F (fig. 2-32) connects the transmitter-distributor and the keyboard-transmitter in a *send only* circuit with line 1 or line 2 as determined by the line switch key. The page printing mechanism is connected to line 3. Connect the plugs of the patch panel as shown in the chart in *a* above to set up condition F.



EL5815-244-12-TM-37

*Figure 2-32. Block diagram, condition F.*

*g. Patch Panel Condition G.* Patch panel condition G (fig. 2-33) connects the page printing mechanism, the keyboard, and monitor jack No. 1 in a half-duplex circuit with line 1. It also connects the transmitter-distributor and monitor jack No. 2 to line 2. Provision is made to permit the use of the page printer to monitor the keyboard during the tape perforation or to make a page copy of a tape being sent through the transmitter-distributor. The page printer will automatically return to the line at the start of an incoming message. Connect the plugs of the patch panel as shown in the chart in *a* above to set up condition G.

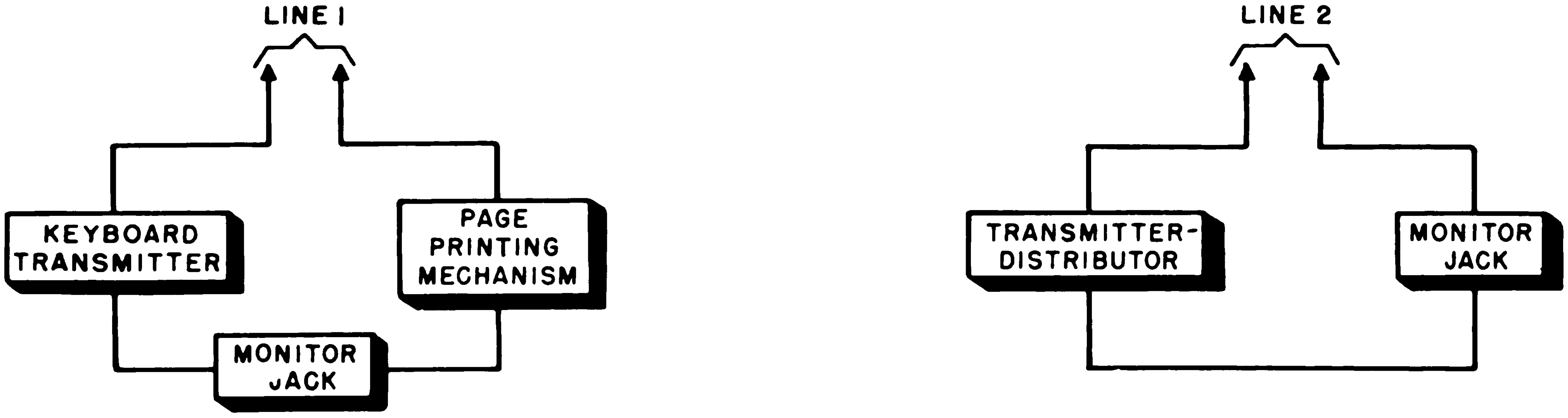


*Figure 2-33. Block diagram, condition G.*

*h. Patch Panel Condition H.* Patch panel condition H (fig. 2-34) connects the transmitter-distributor in line 1. It also connects the keyboard-transmitter to line 2 and the page printing mechanism to line 3. Connect the plugs of the patch panel as shown in the chart in *a* above to set up condition H.

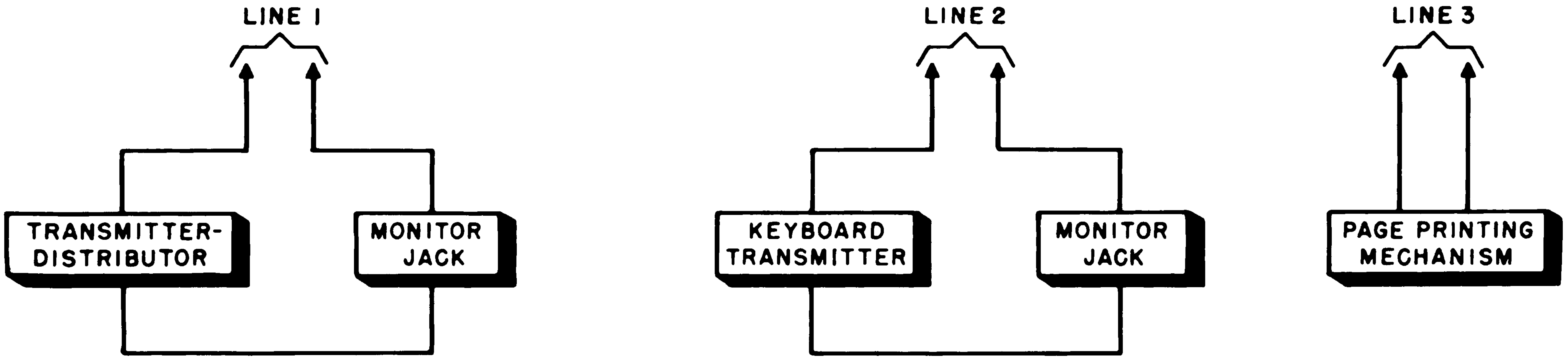


*Figure 2-34. Block diagram, condition H.*

*i. Patch Panel Condition I.* Patch panel condition I (fig. 2-35) connects the page printing mechanism and the keyboard-transmitter in a half-duplex circuit on line 1, and the tape receiver and the transmitter-distributor in a half-duplex circuit on line 2. An external reperforator must be used when it is desired to cut tape locally. Provision is made to permit the use of the page printer to monitor the keyboard during tape perforation. The page printer will automatically return to the line at the start of an incoming message. Connect the plugs of the patch panel as shown in the chart in *a* above to set up condition I.

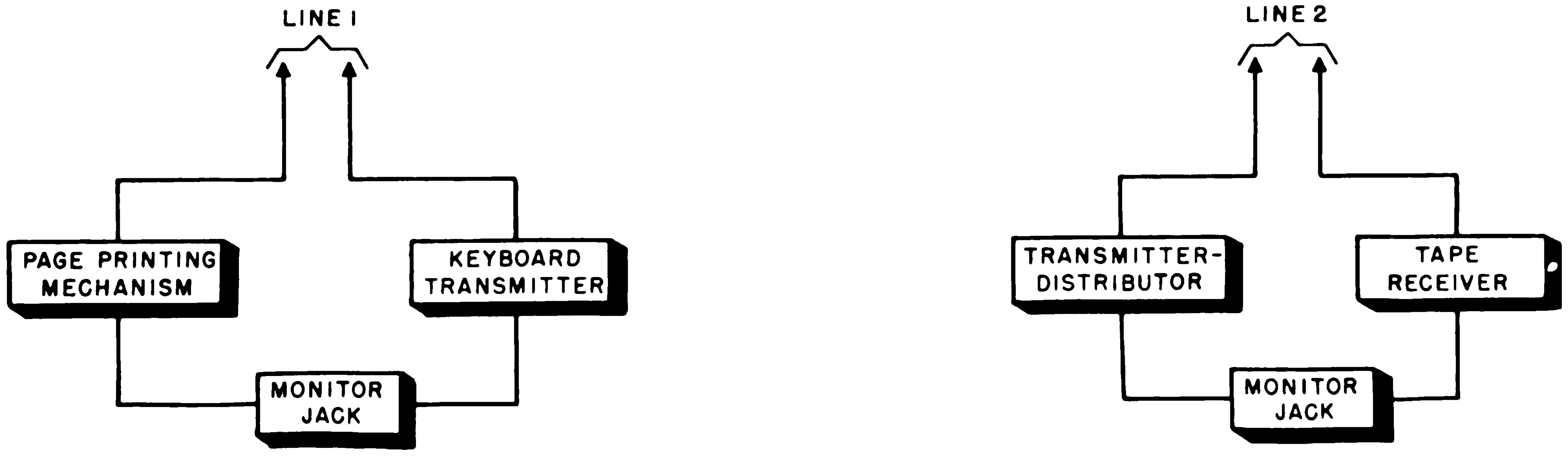


*Figure 2-35. Block diagram, condition I.*

*j. Patch Panel Condition J.* Patch panel condition J (fig. 2-36) connects the page printing mechanism in a half-duplex circuit with the transmitter-distributor on line 1, and the tape receiver and keyboard-transmitter in a half-duplex circuit on line 2. Provision is made to permit the use of the page printer to monitor the tape being sent through the transmitter-distributor. The page printer will automatically return to the line at the start of an incoming message. An external reperforator must be used when it is desired to cut tape locally. Connect the patch panel as indicated by the chart in *a* above to set up condition J.

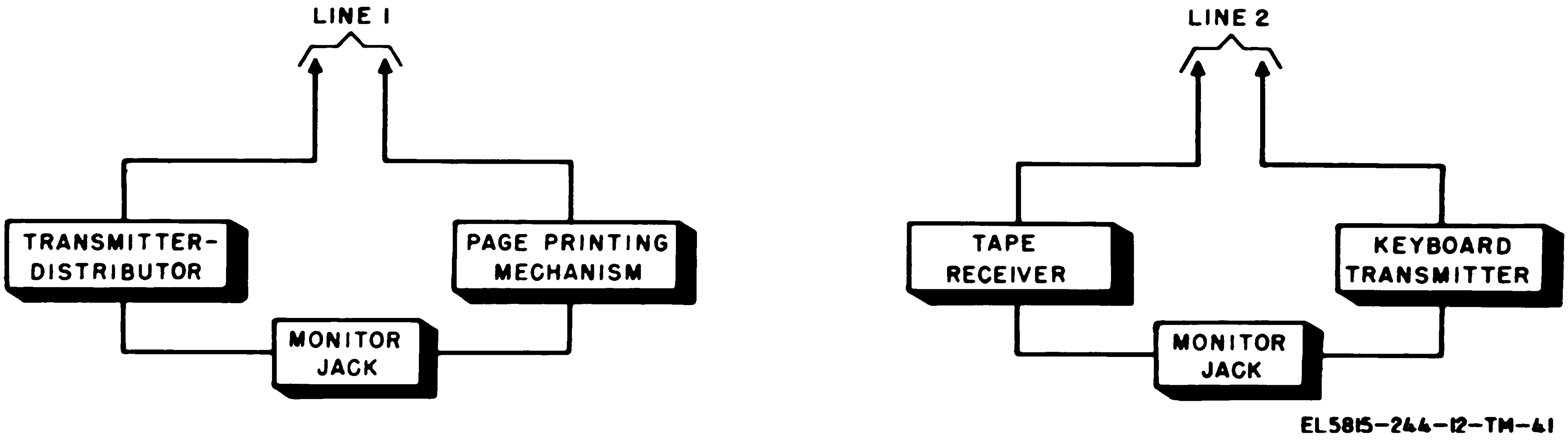


*Figure 2-36. Block diagram, condition J.*

*k. Patch Panel Condition K.* Patch panel condition K (fig. 2-37) is a full-duplex condition in which the keyboard-transmitter is connected to line 1, the transmitter-distributor is connected to line 2, the page printing mechanism is connected to line 3, and the tape receiver connected to line 4. Connect the patch panel as indicated by the chart in *a* above to set up condition K.

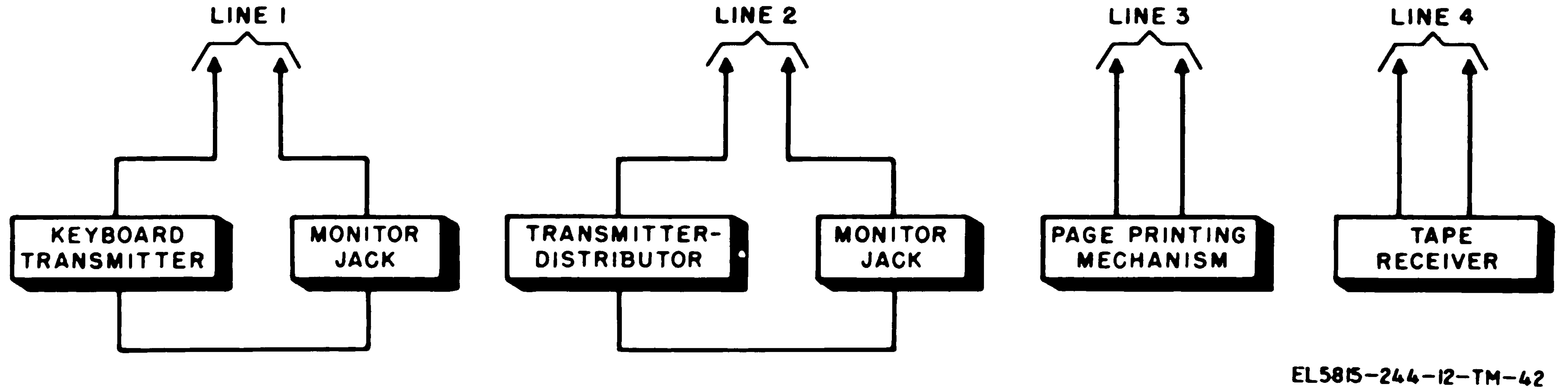


*Figure 2-37. Block diagram, condition K.*

*l. Patch Panel Condition L.* Patch panel condition L (fig. 2-38) is a full-duplex condition in which the transmitter-distributor is connected to line 1, the keyboard-transmitter is connected to line 2, the tape receiver is connected to line 3, and the page printing mechanism is connected to line 4. Connect the patch panel as indicated in the chart in *a* above to set up condition L.

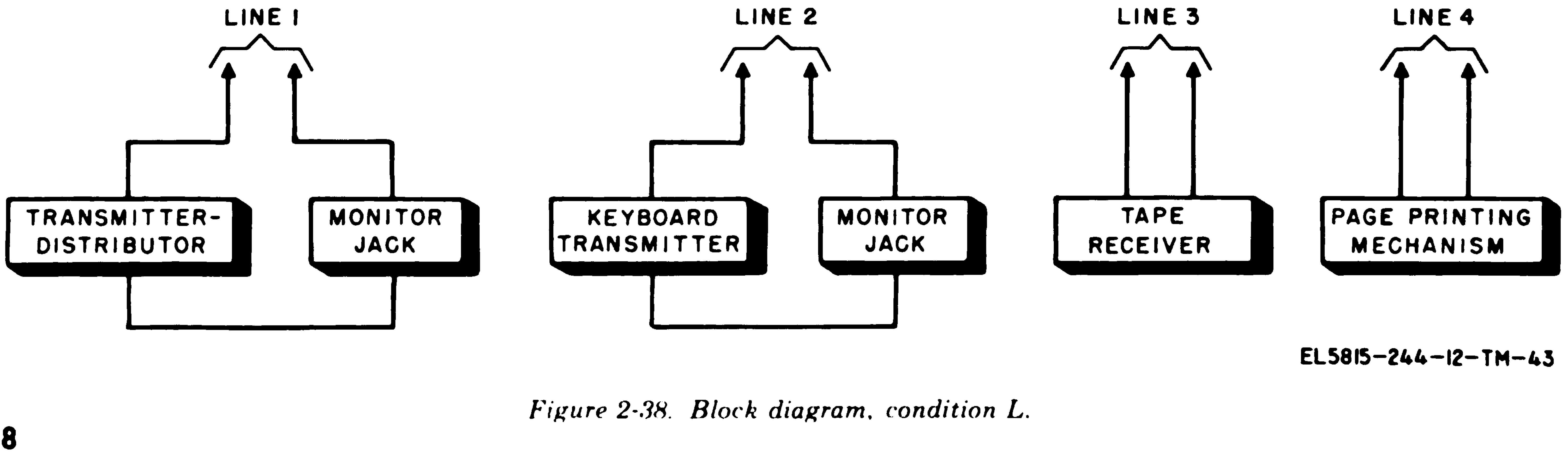


*Figure 2-38. Block diagram, condition L.*

*m. Patch Panel Condition M.* Patch panel condition M (fig. 2-39) connects the transmitter-distributor and the keyboard-transmitter in a *send only* circuit with line 1 or line 2 as determined by the line switch key. The page printing mechanism is connected to line 3 and the tape receiver is connected to line 4. Connect the patch panel as indicated in the chart in *a* above to set up condition M.

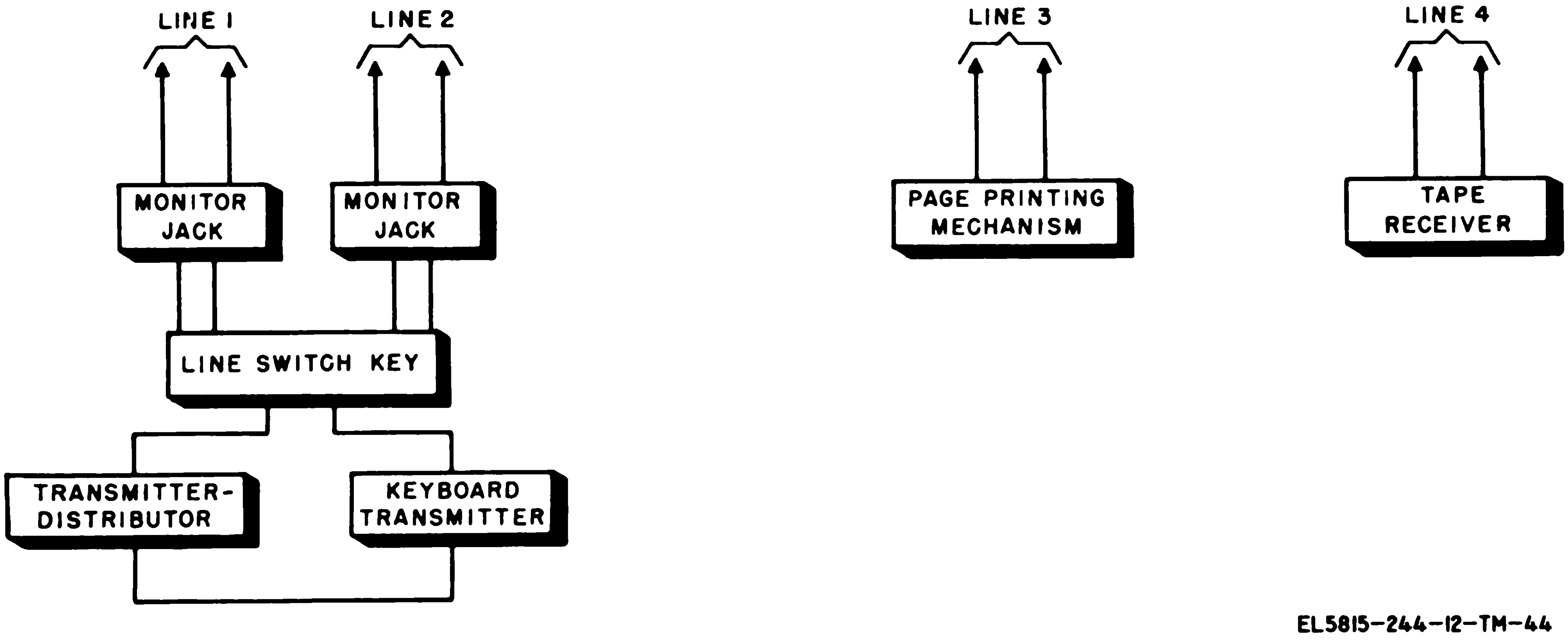


*Figure 2-39. Block diagram, condition M.*

*n. Patch Panel Condition N.* Patch panel condition N (fig. 2-40) connects the page printing mechanism and the keyboard-transmitter in a half-duplex circuit with line 1. It also connects the transmitter-distributor to line 2 and the tape receiver to line 3. This condition is used only when it is not desired to cut tape locally. Connect the patch panel as indicated in the chart in *a* above to set up condition N.

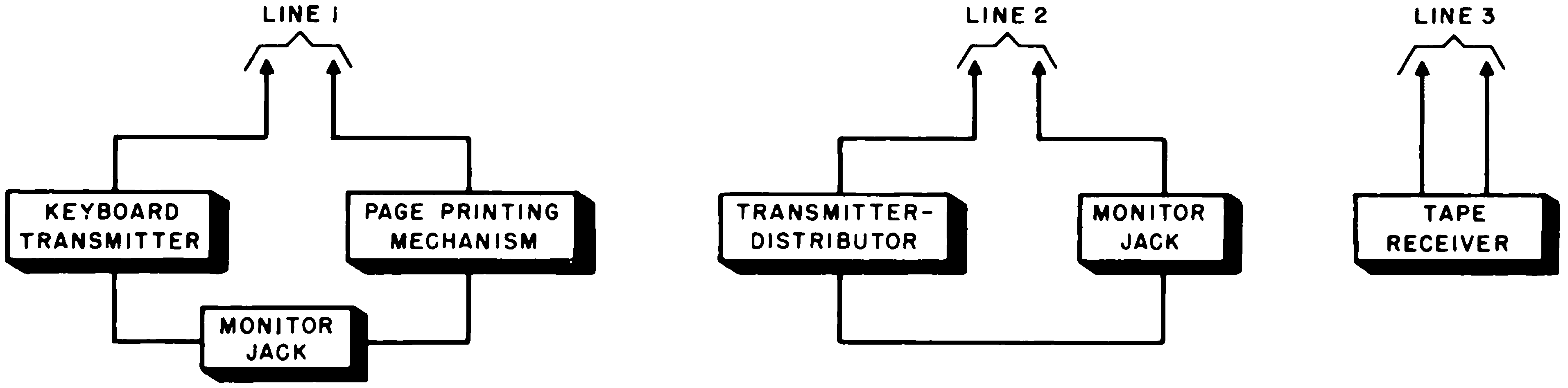


*Figure 2-40. Block diagram, condition N.*

*o. Patch Panel Condition O.* Patch panel condition O (fig. 2-41) connects the transmitter-distributor and the tape receiver in a half-duplex circuit with line 1. It also connects the keyboard-transmitter to line 2 and the page printing mechanism to line 3. This condition is used only when it is not desired to cut tape locally. Connect the patch panel plugs as indicated in the chart in *a* above to set up condition O.

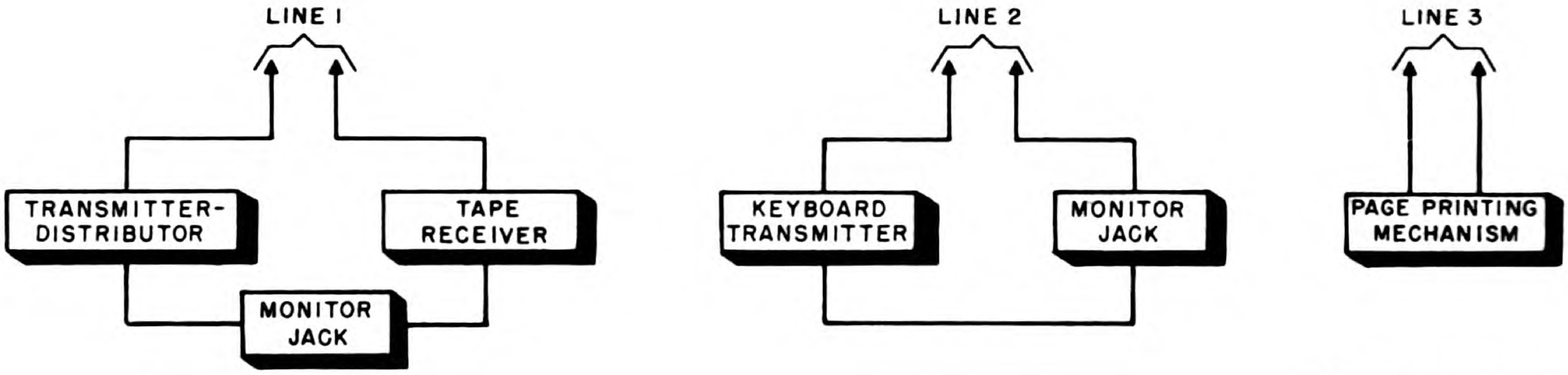


*Figure 2-41. Block diagram, condition O.*

*p. Patch Panel Condition P.* Patch panel condition P (fig. 2-42) connects the transmitter-distributor and the keyboard-transmitter in a *send only* circuit with line 1 or line 2 as determined by the line switch key. The page printing mechanism and the tape receiver are connected to line 3. Connect the patch panel as indicated in the chart in *a* above to set up condition P.

(1) *TT-178/FG and TT-179/FG* (fig. 2-26).

| Patch panel plugs | | Patch panel condition | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P |
| PRINTER RECEIVE | P35 | | | | | | | | | | | | | | | | J38 |
| PRINTER SEND | P36 | | | | | | | | | | | | | | | | J37 |
| TAPE DIST | P37 | | | | | | | | | | | | | | | | J41 |
| REPERF | P38 | | | | | | | | | | | | | | | | J46 |
| MONITOR 1 | P39 | | | | | | | | | | | | | | | | J44 |
| MONITOR 2 | P40 | | | | | | | | | | | | | | | | J45 |
| LINE TEST | P41 | | | | | | | | | | | | | | | | J36 |
| AUTO LINE RET IN | P42 | | | | | | | | | | | | | | | | J42 |
| AUTO LINE RET OUT | P43 | | | | | | | | | | | | | | | | J43 |
| LINE 1 | P44 | | | | | | | | | | | | | | | | J39 |
| LINE 2 | P45 | | | | | | | | | | | | | | | | J40 |
| LINE 3 | P46 | | | | | | | | | | | | | | | | J35 |
| LINE 4 | P47 | | | | | | | | | | | | | | | | J47 |
| D.C. TEST | P48 | | | | | | | | | | | | | | | | J48 |

(2) *All models except TT-178/FG and TT-179/FG* (fig. 2-27).

| Patch panel plugs | | Patch panel condition | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P |
| PRINTER RECEIVE | P203 | | | | | | | | | | | | | | | | J214 |
| PRINTER SEND | P204 | | | | | | | | | | | | | | | | J213 |
| TAPE DIST | P213 | | | | | | | | | | | | | | | | J209 |
| REPERF | P214 | | | | | | | | | | | | | | | | J202 |
| MONITOR 1 | P206 | | | | | | | | | | | | | | | | J207 |
| MONITOR 2 | P205 | | | | | | | | | | | | | | | | J208 |
| LINE TEST SW | P209 | | | | | | | | | | | | | | | | J204 |
| AUTO LINE RET IN | P212 | | | | | | | | | | | | | | | | J212 |
| AUTO LINE RET OUT | P210 | | | | | | | | | | | | | | | | J210 |
| LINE 1 | P207 | | | | | | | | | | | | | | | | J206 |
| LINE 2 | P208 | | | | | | | | | | | | | | | | J205 |
| LINE 3 | P202 | | | | | | | | | | | | | | | | J203 |
| LINE 4 | P201 | | | | | | | | | | | | | | | | J201 |
| D. C. TEST | P211 | | | | | | | | | | | | | | | | J211 |

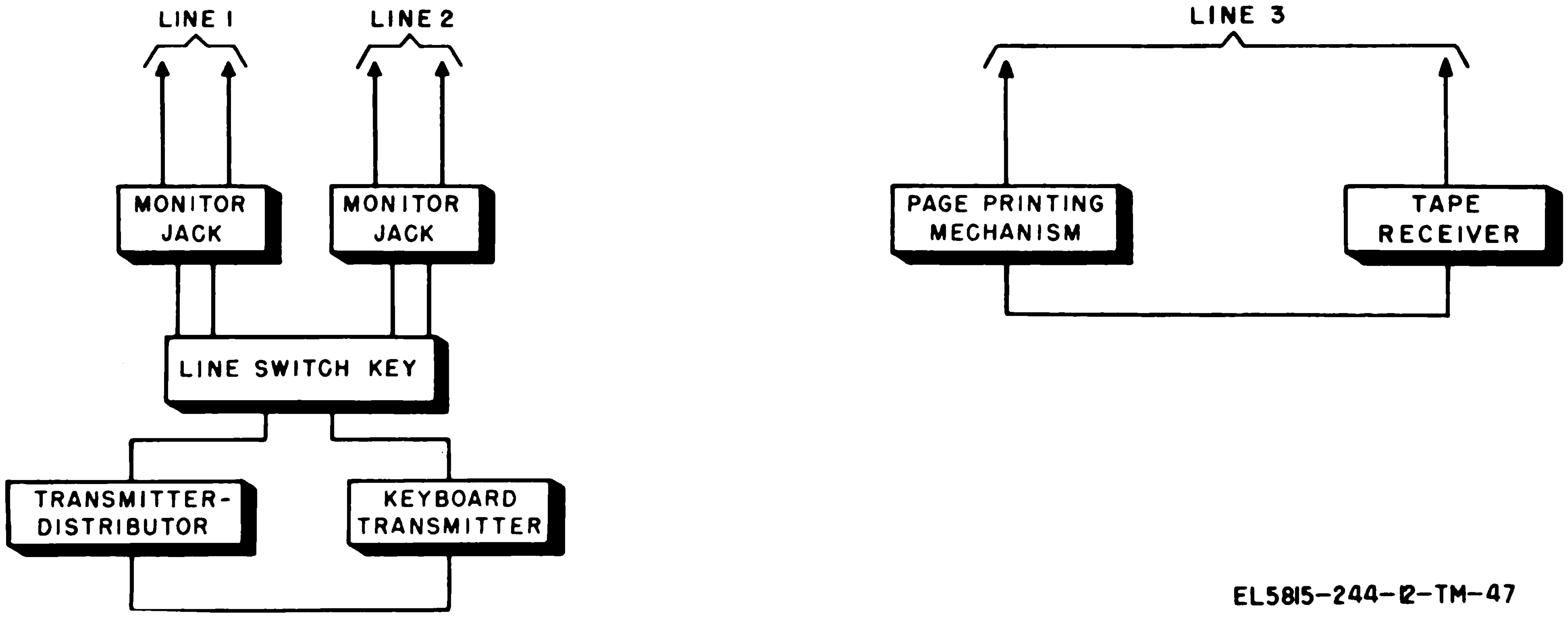


*Figure 2-42. Block diagram, condition P.*

### 2-19. Character Pulse Alignment AN/UGC-30, AN/UGC-30X, AN/FGC-52, AN/FGC-52X, and AN/FGC-68

*a.* When power for the character pulse is to be supplied by an external source, use a dc voltmeter to verify the polarity and voltage (60 volts dc) of the supply. Connect the positive wire to terminal E301 and the negative wire to terminal E302 on the control box. Place the CHARACTER PULSE switch at EXT BAT.

*b.* When power for the character pulse is to be supplied by the power supply of the AN/FGC-52 or AN/FGC-52X, place the CHARACTER PULSE switch at INT BAT and connect the wires from the external source to terminals E301 and E302 on the control box. No further adjustments are required. The external source closes a contact in this instance.

### 2-20. Alternate Patch Panel Arrangements Using Automatic Line Return

NOTE

The general information in this paragraph is applicable to all Teletypewriter Sets AN/FGC-25(*). The reference symbols used are those assigned to TT-178/FG and TT-179/FG.

*a.* The patch panel can be patched in numerous ways in addition to the typical patch panel conditions listed in paragraph 2-18. In all conditions using the automatic line return, however, the connections indicated in the solid line portion of figure 33 should be made as follows:

(1) Place plug P35 into jack J42.
(2) Place plug P41 into jack J43.
(3) Place plug P42 into jack J35.
(4) Place plug P43 into jack J38.
(5) Place plug P48 into jack J48.

*b.* The dotted line portion of figure 2-25 shows the remaining components which may be required for operation in a particular circuit arrangement. The required components are placed in series between plug P38 and jack J41. For example, if the tape transmitter (TAPE DIST) is to be included in the circuit arrangement, place plug P38 into jack J37 and place plug P37 into jack J41. Likewise, if both the tape transmitter and monitor jack (MONITOR 1) are to be used, proceed as follows:

(1) Place plug P38 into jack J39.
(2) Place plug P39 into jack J37.
(3) Place plug P37 into jack J41.

*c.* The local tape perforation circuit is always available regardless of the patching arrangement utilized. The circuit is closed when the keyboard control switch is set to TAPE and the perforator control switch is set to KEYBD.

### 2-21. Signal Line Connections

Connect the signal lines to the teletypewriter set as follows:

*a.* Remove the capnuts from the LINE 1 and LINE 2 LINE INCREASE MA potentiometers (fig. 2-9) on the rear control panel of the perforator. With a screwdriver, adjust both potentiometers to their maximum counterclockwise (maximum resistance) setting.

*b.* Adjust the REPERFORATOR SIGNAL switch to the 20- or 60-ma setting, whichever is used on the signal line on which the perforator is connected. Use the 60-ma setting for 30-ma polar reception.

*c.* Adjust the BIAS switch as required by the conditions of the line on which the perforator is connected. The upper setting of the switch is for 20-ma operation, the lower setting is for 60-ma operation, and the midpoint setting is for polar operation.

*d.* Turn the LINE 1 and LINE 2 switches (fig. 2-9) to the OFF position.

*e.* Adjust the page printer SIGNAL switch (fig. 2-8) to 20- or 60-ma operation, whichever is used on the signal line to which the page printer is connected. The upper setting is for 20-ma neutral and the lower setting is for 60-ma neutral or 30-ma polar operation.

*f.* Adjust the BIAS switch of the page printer as required by the conditions on the line to which the page printer is connected. The upper setting of the switch is for 20-ma neutral operation, the lower setting is for 60-ma neutral operation, and the midpoint setting is for polar operation.

*g.* Connect the signal lines to the terminals designated by the setting of the patch panel. Lines 1 and 2 have three terminals designated A, B, and C. Connect the signal lines to the A and B terminals of these lines. Lines 3 and 4 have only two terminals. Connect the signal lines to these terminals if required.

### 2-22. Circuit Lineup (Except AN/FGC-161 and AN/FGC-162)

*a.* To secure the best possible machine operation, it is necessary to adjust the teletypewriter set to meet the conditions of the signal line. Circuit lineup normally includes adjusting the line current and rangefinder dial assemblies for the equipment at both ends of the circuit, followed by an exchange of test copy. Before the equipment is installed on the line, it is necessary for all personnel concerned to know the type of operation required and the predetermined source of line current.

*b.* The station from which the circuit lineup is directed is called the control station. Generally the station of higher authority is the control station. Lineup of a circuit between stations of equal authority is normally directed by the station that has the lowest numerical designation.

*c.* Line current for any particular line in a system is usually supplied by the station in the network that has the transmitting device on that line. If two or more stations have transmitting devices on the line, the station of highest authority usually supplies the power. Two or more stations may supply current when it is necessary because of excessive line leakage or other line factors. The teletypewriter sets are designed to supply line current, either as the main source of supply or on a series-aiding basis, only on line 1 or line 2. Current on line 3 or line 4 can neither be supplied nor controlled by the set.

*d.* Polar or neutral signals can be received by either the page printer or by the perforator, but only neutral signals can be sent from the keyboard-transmitter or from the transmitter-distributor. Polar signals must be 30 ma while neutral signals may be either 20 or 60 ma.

*e.* Line current is normally adjusted on line 1 or line 2 as follows:

(1) Turn the page printer and perforator POWER switches (figs. 2-5 and 2-9) to the ON positions.

(2) If the set is to supply current to line 1 or line 2, or both, set the appropriate LINE switch or switches to the ON positions.

(3) The control station turns its line 1 or 2 INCREASE MA potentiometer to maximum counterclockwise (maximum resistance) position.

(4) Noncontrol stations turn their LINE INCREASE MA potentiometer to the maximum clockwise (minimum resistance) position.

(5) The control station gradually decreases resistance until the current reaches 75 ma for 60-ma circuits, or 30 ma for 20-ma circuits.

(6) Noncontrol stations then add resistance gradually to bring the current down to the predetermined level.

(7) If enough current cannot be supplied to the line in this manner, proceed as follows:

(a) Turn the perforator and page printer POWER switches to the OFF positions.

(b) Disconnect the signal line lead from the B terminal of the appropriate line and reconnect it to the C terminal. This decreases the internal resistance of the perforator by 1,000 ohms and allows more current to flow through the circuit.

(c) Repeat the procedures described in (3) through (6) above.

(d) If sufficient current cannot be obtained on the signal line in this manner, another station in the circuit will have to supply power on a series-aiding basis. To accomplish this, have another station on the line turn the LINE 1 or 2 INCREASE MA potentiometer counterclockwise to its maximum resistance position. Then, instruct that station to turn the LINE switch to the ON position, and proceed to adjust the LINE 1 or 2 INCREASE MA potentiometer to decrease the resistance until the proper line current is attained.

(e) If the current decreases instead of increasing, reverse the signal line connections.

*f.* The rangefinder dial assemblies (figs. 2-21 and 2-22 are adjusted as follows:

(1) Noncontrol station transmits repeated R

and Y signals. The control station then turns its rangefinder dial to the maximum and minimum good copy position. If the machine continues to receive good copy when the rangefinder dial is set at zero, use zero as the low reference point. Determine the midpoint between the two settings and adjust the rangefinder dial assembly to this point. Both page printer and perforator rangefinders are adjusted in this manner. When the setting is complete, the control station signals the noncontrol station with two 5-second break signals.

(2) The control station now transmits repeated R and Y signal code groups while the noncontrol station adjusts the rangefinders in the same manner as the control station described in (1) above.

(3) The stations then exchange test messages. The messages must be correctly received.

### 2-23. Lineup of Transmitter-Distributor Control Box (AN/UGC-30, AN/UGC-30X, AN/FGC-52, AN/FGC-52X, and AN/FGC-68) (fig. 2-43)

*a. External Battery Supplied.*

(1) *Control circuit requirements.* When external battery is applied to the binding posts atop the transmitter-distributor control box, optimum performance may be expected if the following requirements are maintained.

(a) The voltage applied during each pulse is 60 volts dc.

(b) The current value of each pulse is 20 ma (through an appropriate adjustment of the character pulse potentiometer).

(c) The repetition rate of received pulses (circuit closures from the externally located equipment) must not exceed one pulse for each code group transmitted from the local transmitter-distributor.

(d) The transmitter-distributor plug is seated firmly in the jack of the control box, and the plug on the cord extending from the control box is firmly seated in the jack on the side of the perforator base.

(2) *Operation check.* Check the operation of the control box as follows:

(a) Position the CHARACTER PULSE switch to EXT. BAT.

(b) Position the TD CLUTCH switch to STEP.

(c) Insert a tape in the transmitter-distributor and move the START-STOP lever to START.

(d) Have the station connected at the binding posts commence with the transmission of pulses (*a* (1) above).

(e) Observe the transmission pattern of the transmitter-distributor; one code group should be transmitted for each pulse received.

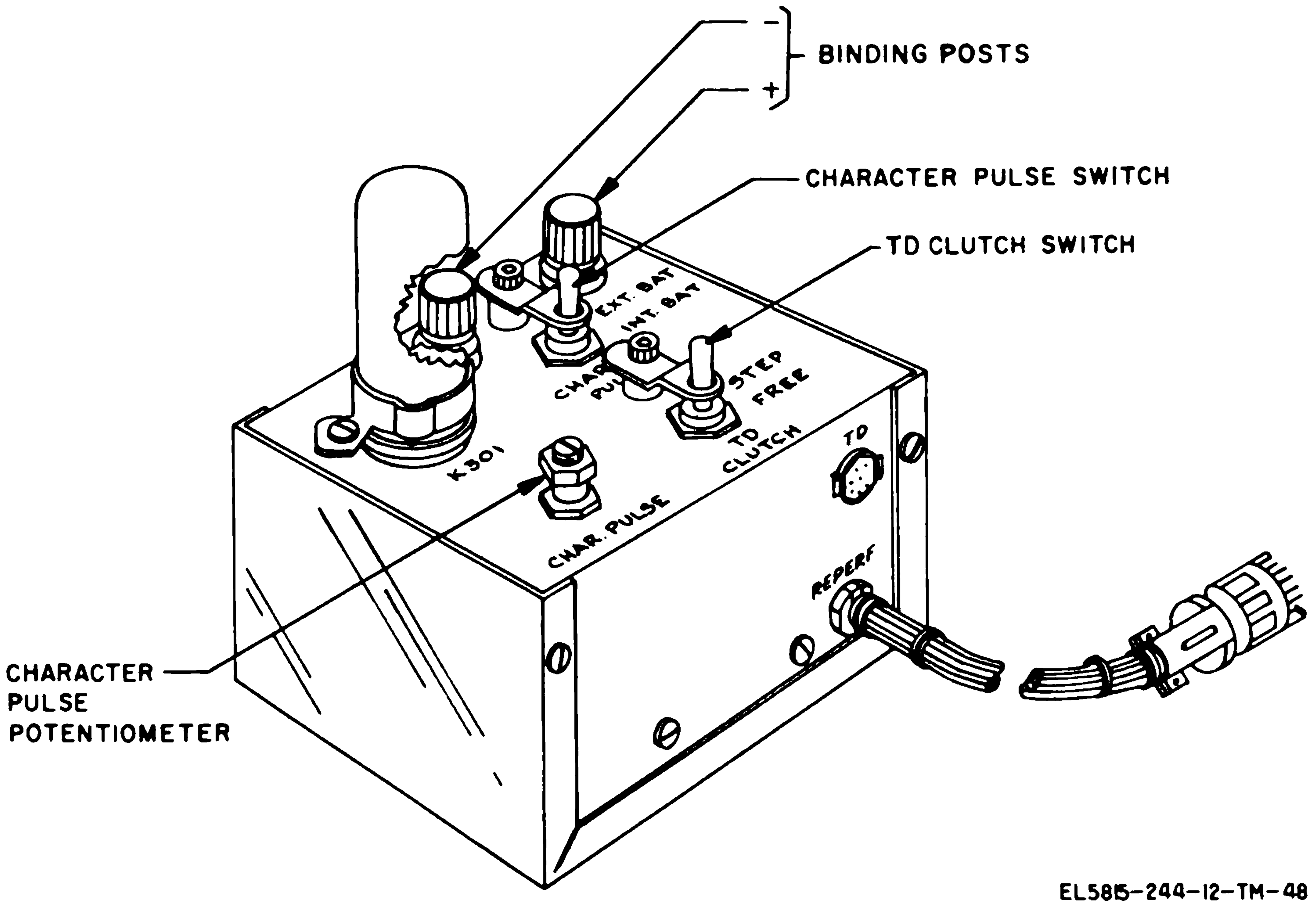


*Figure 2-43. Transmitter-distributor control box (AN/FGC-52, AN/FGC-52X, AN/FGC-68 AN/FGC-162, AN/UGC-30 and AN/UGC-30X ).*

*b. Internal Battery Supplied.*

(1) *Control circuit requirements.* When internal battery is applied to the control circuit connected to the binding posts, the voltage and current values are determined by fixed resistors in the local equipment and no readings need be taken. However, the requirements in *a* (1)(*c* ) and (*d* ) above are applicable.

(2) *Operational check.*

(a) Position the CHARACTER PULSE switch to INT. BAT.

(b) Position the TD CLUTCH switch to STEP.

(c) Insert a tape and position the transmitter-distributor START-STOP lever to START.

(d) Place a short across the binding posts momentarily and then quickly remove the short; the transmitter-distributor should transmit a signal code group each time this procedure is repeated.

### 2-24. Circuit Lineup (AN/FGC-161 and AN/FGC-162)

*a.* To secure the best possible machine operation, it is necessary to adjust the range of the teletypewriter set periodically. Circuit lineup normally consists of adjusting the rangefinder dial assemblies for the equipment at both ends of the circuit, followed by an exchange of test copy. Before the equipment is installed on the line, it is necessary for all personnel concerned to know the type of operation required.

*b.* The circuit from which the circuit lineup is directed is called the control station. Generally the station of higher authority is the control station. Lineup of a circuit of equal authority normally is directed by the station that has the lowest numerical designation.

*c.* The rangefinder dial assemblies (fig. 2-37 and 2-38) are adjusted as follows:

(1) Noncontrol stations transmit repeated R and Y signal code groups. The control station then turns its rangefinder dial assembly to the maximum and minimum good copy position. If the machine continues to receive good copy when the rangefinder dial assembly is set at zero, use zero as the low reference point. Determine the midpoint between the two settings and adjust the rangefinder dial assembly to this point. Both page printer and perforator rangefinders are adjusted in this manner.

(2) The control station now transmits repeated R and Y signal code groups while the noncontrol stations adjust the rangefinders in the same manner as the control station described in (1) above.

(3) The stations then exchange test messages. If the messages are correctly received, the stations should be aligned.

## Section V. CONNECTION TO SIGNAL LINE (AN / FGC-161 and AN / FGC-162)

### 2-25. General

Teletypewriter Sets AN/FGC-161 and AN/FGC-162 can be configured in two different conditions by patching certain connections on the terminal board located inside the page printer terminal box (fig. 2-7). In each condition, various operational possibilities can be achieved by varying the connections of the external signal lines and jumpers on the outside of the terminal boxes (figs. 2-7 and 2-12). The two terminal box patching conditions are described below.

### 2-26. Terminal Box Patching Conditions (AN/FGC-161 and AN/FGC-162)

*a. Condition A.* Connect the sets for Condition A as follows:

(1) Remove cover from page printer terminal box (fig. 2-7).

(2) On terminal board A1TB2 (fig. 2-44), connect jumper wire between terminals 1 and 2.

(3) Connect page printer transmitter contact lines to terminals 3 and 4 of A1TB2.

(4) Connect a jumper wire pair between the A1TB1 SPCL SEND terminals of the page printer and perforator terminal boxes.

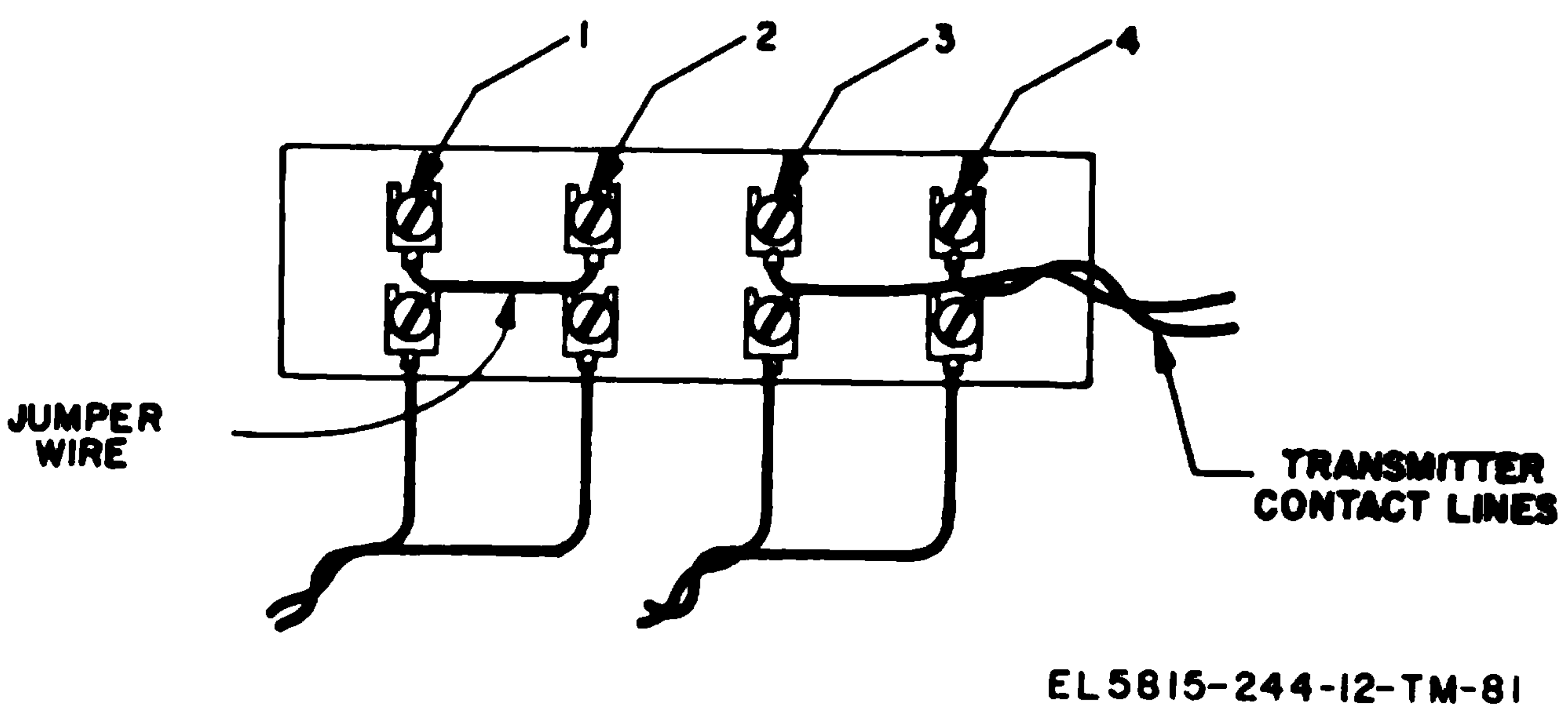


*Figure 2-44. Terminal Board A1TB2 on page printer terminal box (TT-666/FG, TT-66A/FG, TT-666B/FG, TT-668/FG, TT-668A/FG, and TT-668B/FG ).*

*b. Condition B.* Connect the set for Condition B as follows:

(1) Remove cover from page printer terminal box (fig. 2-7).

(2) On terminal board A1TB2, remove jumper wire from terminals 1 and 2.

(3) Remove page printer transmitter contact lines from terminals 3 and 4 of A1TB2 and connect to terminals 1 and 2.

(4) Connect cable (2 wire) between the A1TB1 SPCL SEND terminals of page printer and perforator terminal boxes.

### 2-27. Typical Operational Possibilities

Subparagraphs *a* and *b* below contain charts which give terminal board connections for some typical desired operations. Block diagrams are furnished to aid in visualizing the different operations.

*a. Typical Operational Possibilities for Terminal Board Patching Condition A*

| Operation desired | Terminal board connections | |
|---|---|---|
| | From | To |
| 1. Transmit to send line from keyboard transmitter. Page printing mechanism may be patched to monitor send line or receive from receive line (fig. 2-45). | Page printer XMTR OUTPUT, terminals 4 and 5. | Send line. |
| | Page printer RCVR INPUT | Receive line or page printer XMTR OUTPUT MON, terminals 6 and 7. |
| 2. Transmit to send line from transmitter-distributor. Tape receiver may be patched to monitor send line or receive from receive line (fig 2-46) | Perforator XMTR OUTPUT, terminals 4 and 5. | Send line. |
| | Perforator RCVR INPUT, terminals 9 and 10. | Receive line or perforator XMTR OUTPUT MON, terminals 6 and 7. |
| 3. Receive from receive line with page-printing mechanism (fig. 2-47). | Page printer RCVR INPUT, terminals 9 and 10. | Receive line. |
| 4. Receive from receive line with tape receiver (fig 2-48). | Perforator RCVR INPUT, terminals 9 and 10. | Receive line. |
| 5. Use page-printing mechanism to provide page copy from message tape fed into transmitter-distributor without transmitting to send line. Use tape receiver to receive from receive line (fig 2-49). | Performator XMTR OUTPUT, terminals 4 and 5. | Page printer RCVR INPUT, terminals 9 and 10. |
| | Perforator RCVR INPUT, terminals 9 and 10. | Receive line. |
| 6. Prepare tape locally. The page-printing mechanism may be patched to monitor keyboard-transmitter or receive from receive line (fig. 2-50). | Page printer XMTR OUTPUT, terminals 4 and 5. | Perforator RCVR INPUT terminals 9 and 10. |
| | Page printer RCVR INPUT, terminals 9 and 10. | Receive line or page printer XMTR OUTPUT MON, terminals 6 and 7. |
| 7. Transmit to send line from transmitter-distributor and monitor send line with page-printing mechanism. Use tape receiver to receive from receive line (fig 2-51). | Performator XMTR OUTPUT, terminals 4 and 5. | Send line. |
| | Perforator XMTR OUTPUT MON, terminals 6 and 7. | Page printer RCVR INPUT, terminals 9 and 10. |
| | Perforator RCVR INPUT, terminals 9 and 10. | Receive line. |
| 8. Transmit from page printer to tape receiver and page printing receiver (fig 2-52). | Page printer XMTR OUTPUT, terminals 4 and 5. | Perforator RCVR INPUT, terminals 9 and 10. |
| | Page printer XMTR OUTPUT Mon, terminals 6 and 7. | Page printer RCVR INPUT, terminals 9 and 10. |
| 9. Transmit from transmitter distributor to tape receiver and page printing receiver (fig. 2-53) | Perforator XMTR OUTPUT, terminals 4 and 5. | Page printer RCVR INPUT, terminals 9 and 10. |
| | Perforator XMTR OUTPUT MON, terminals 6 and 7. | Perforator RCVR INPUT, terminals 9 and 10. |

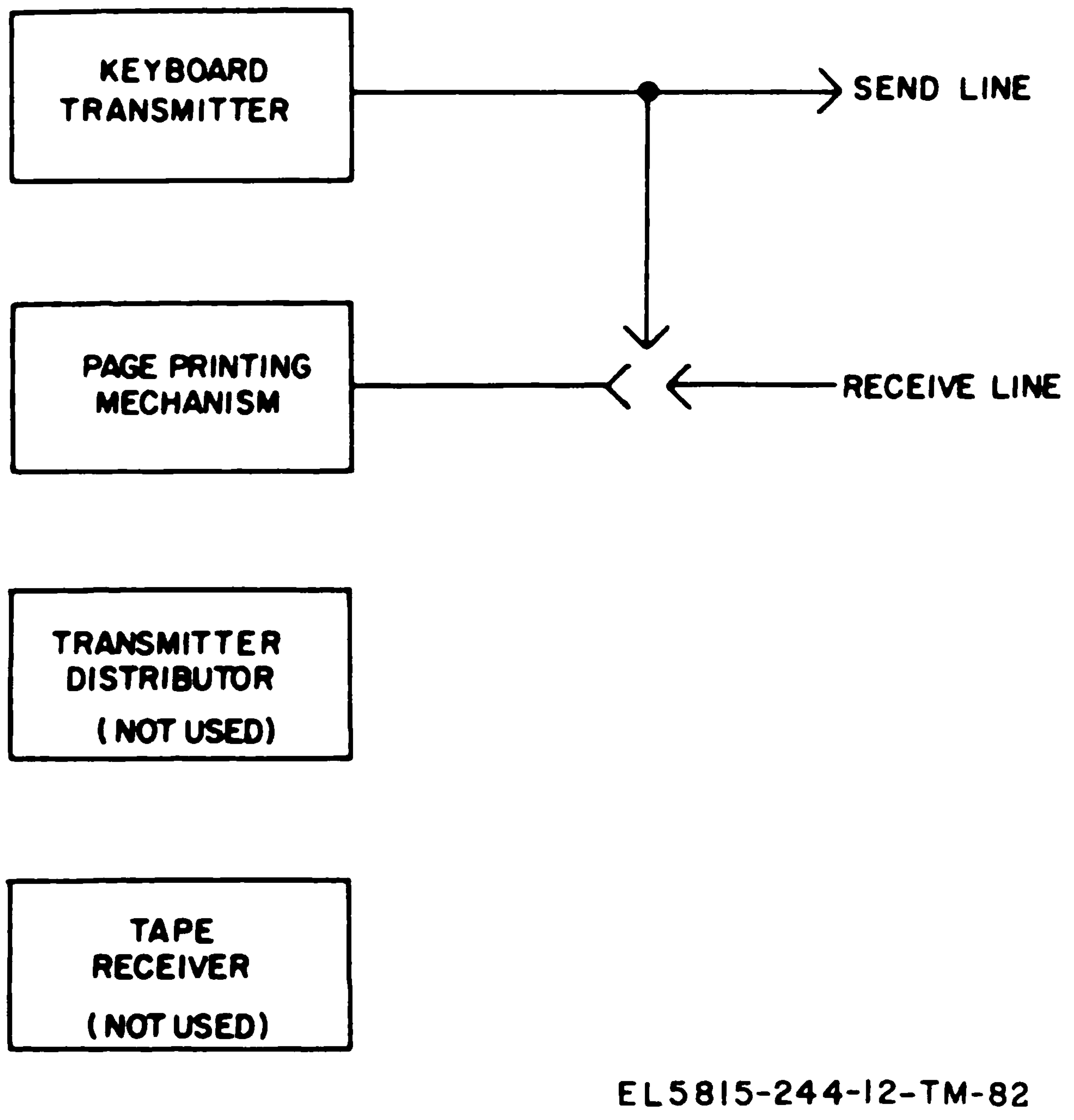


*Figure 2-45. Block diagram for terminal box patching condition A, operation 1 (AN/FGC-161 and AN/FGC-162 ).*

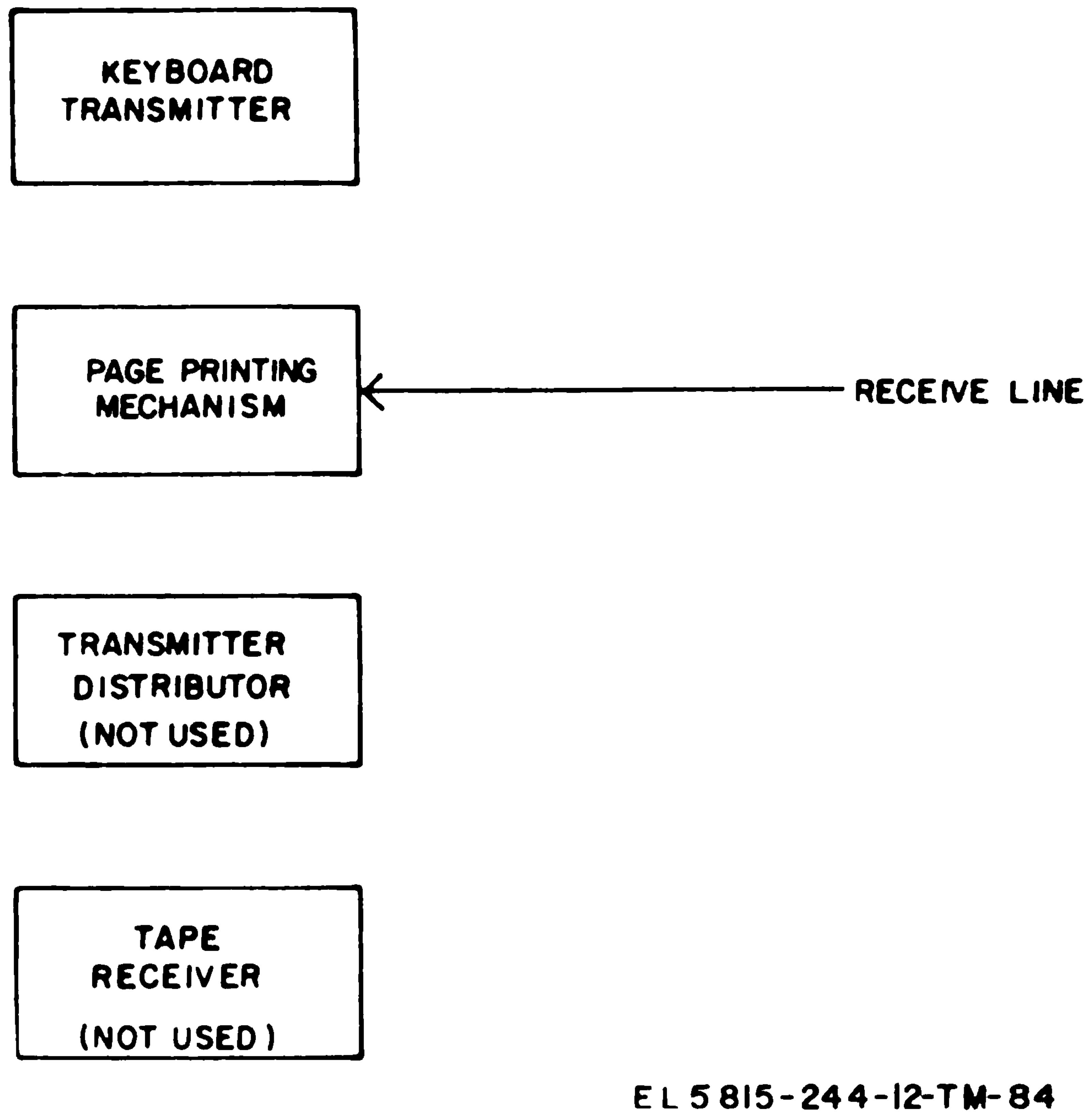


*Figure 2-47. Block diagram for terminal box patching condition A, operation 3 (AN/FGC-161 and AN/FGC-162 ).*

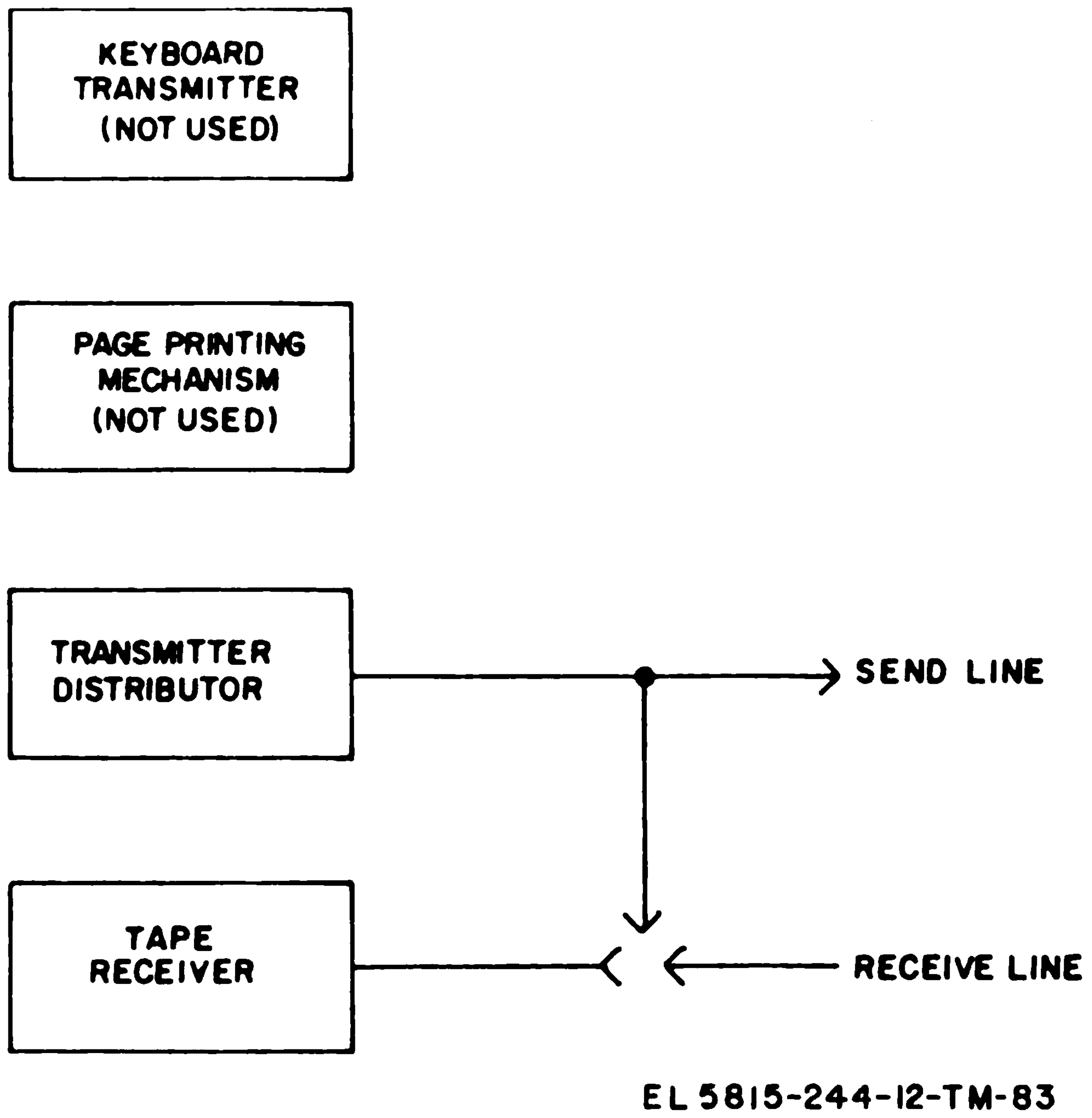


*Figure 2-46. Block diagram for terminal box patching condition A, operation 2 (AN/FGC-161 and AN/FGC-162 ).*

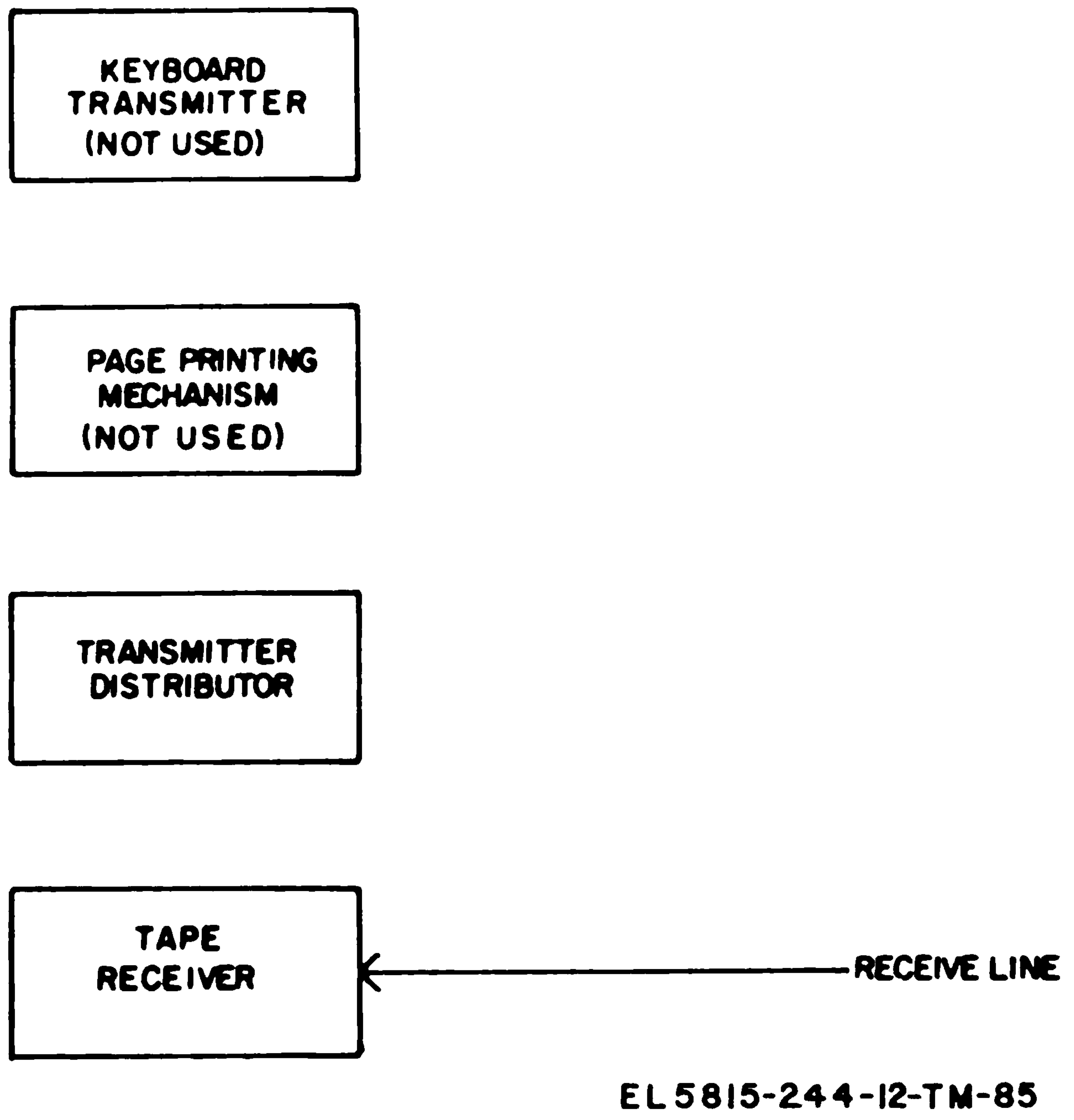


*Figure 2-48. Block diagram for terminal box patching condition A,operation 4 (AN/FGC-161 and AN/FGC-162 ).*

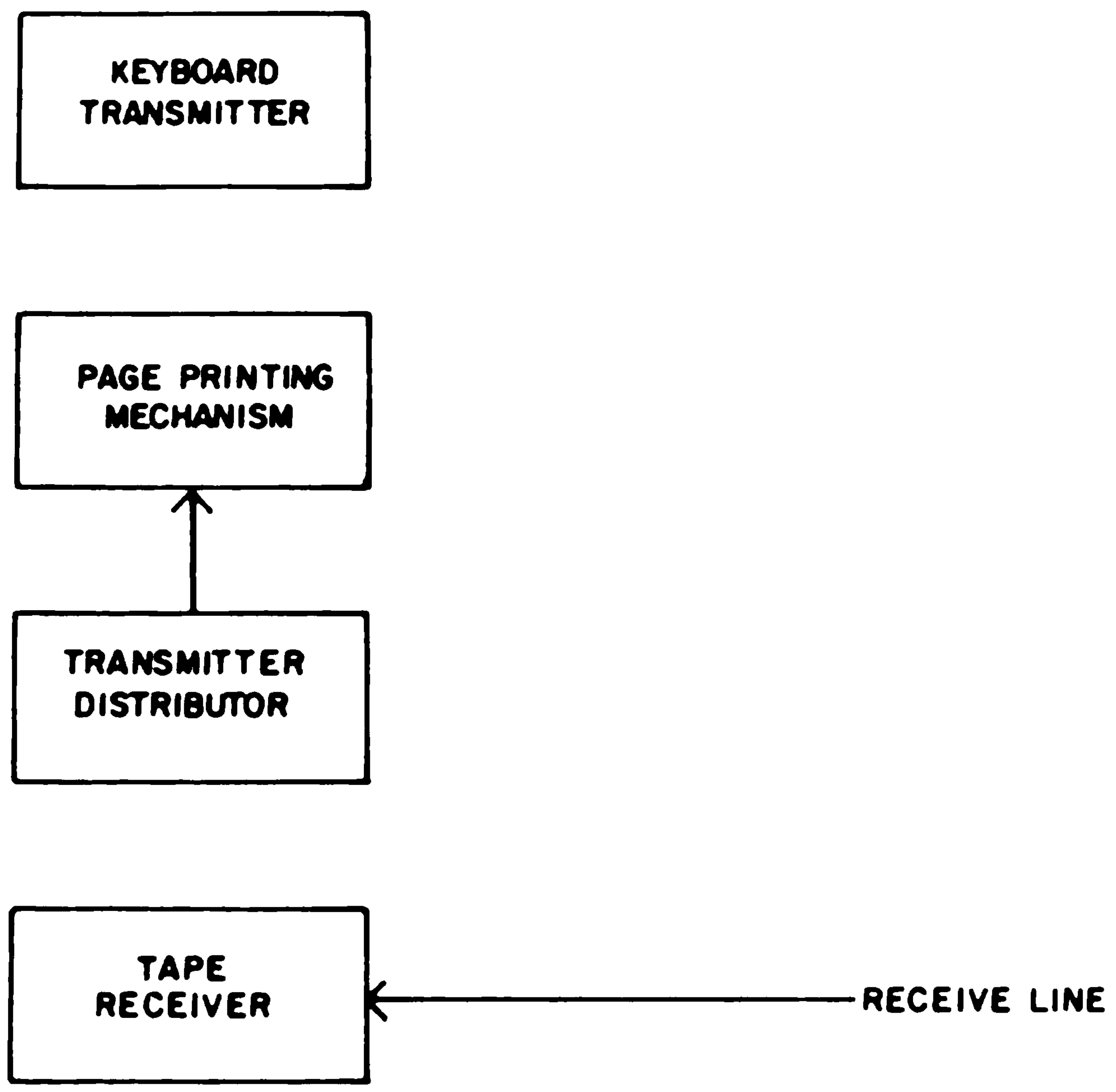


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*Figure 2-49. Block diagram for terminal box patching condition A, operation 5 (AN/FGC-161 and AN/FGC-162).*

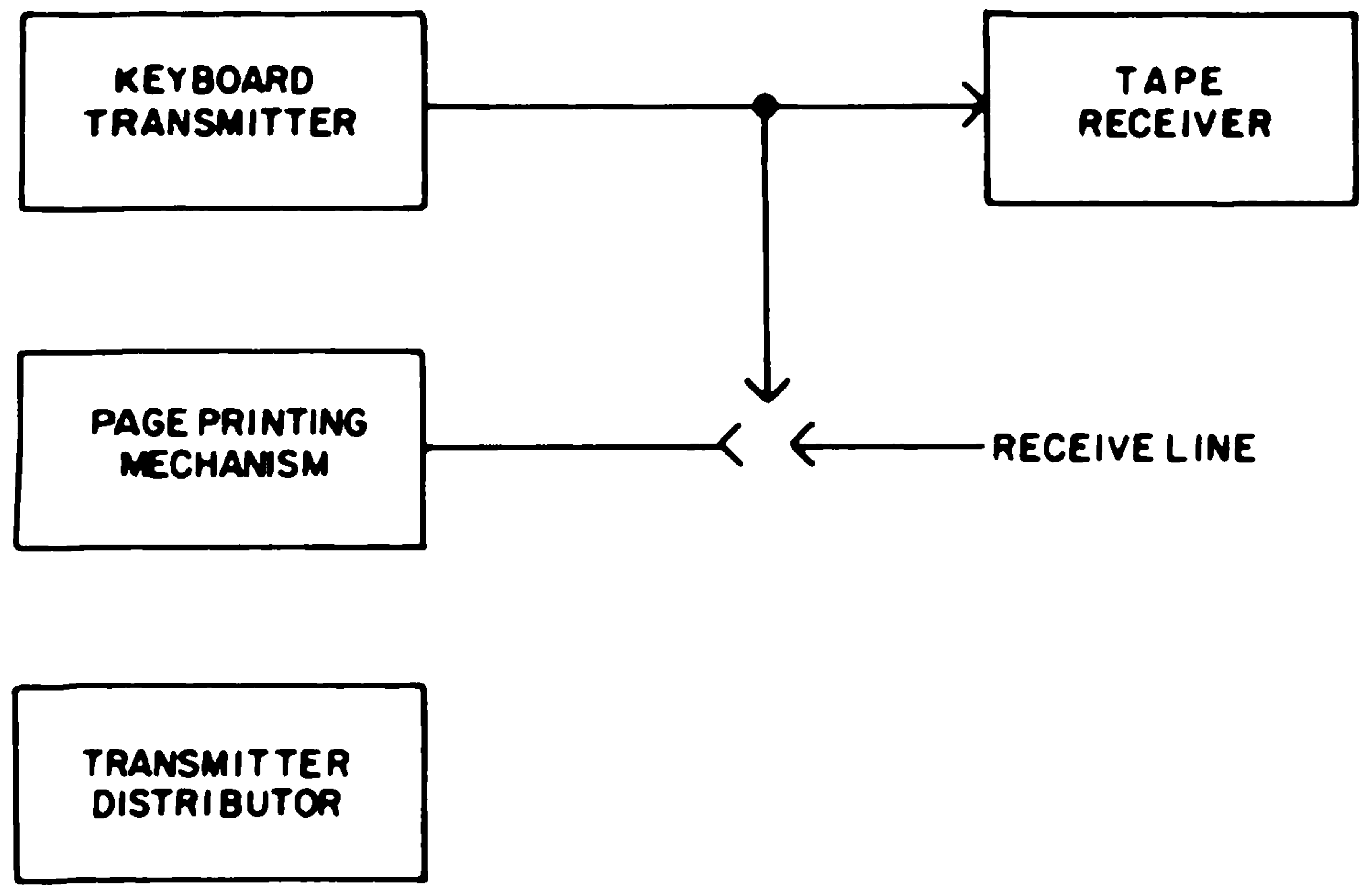

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*Figure 2-50. Block diagram for terminal box patching condition A, operation 6 (AN/FGC-161 and AN/FGC-162).*

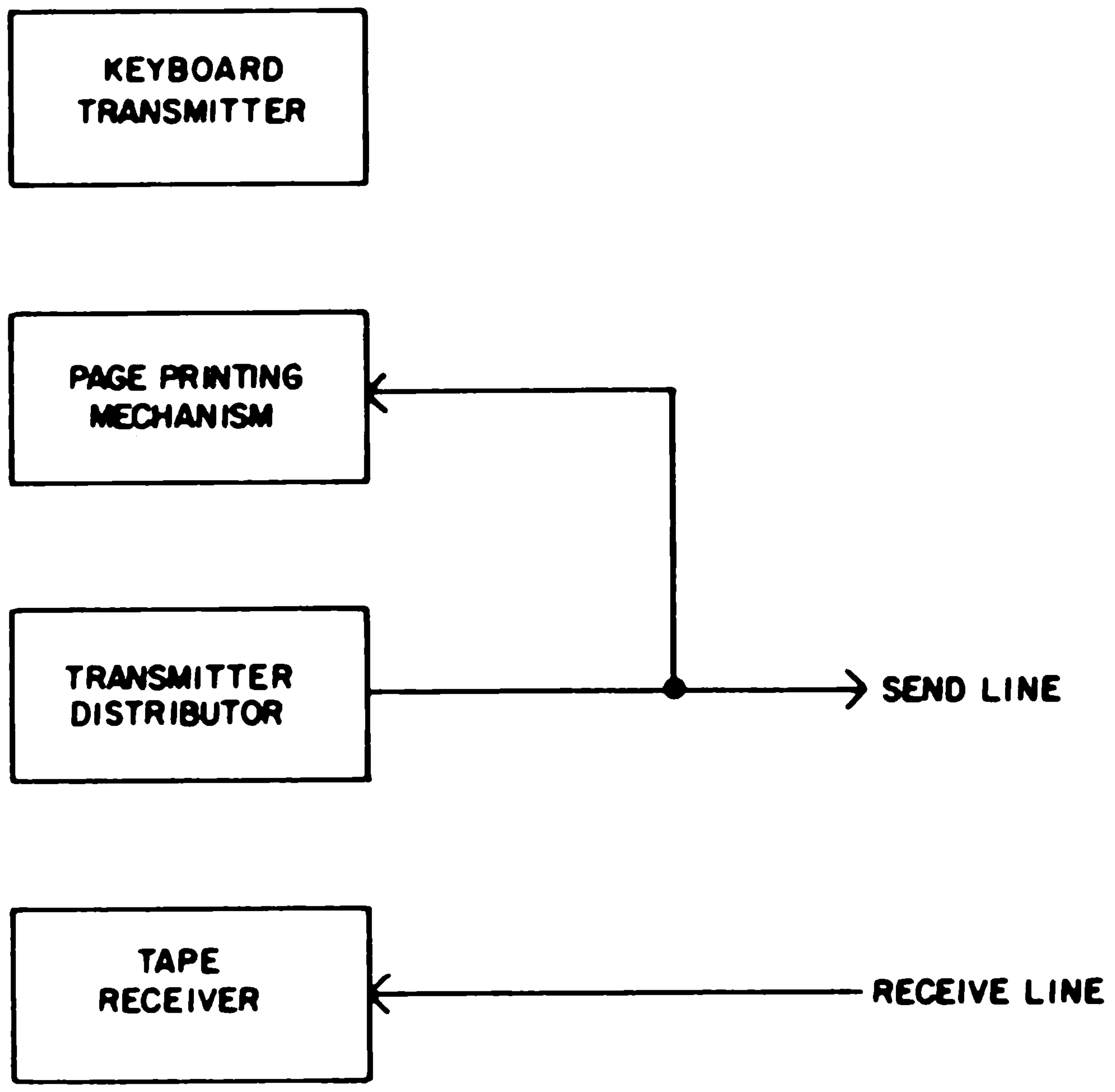

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*Figure 2-51. Block diagram for terminal box patching condition A, operation 7 (AN/FGC-161 and AN/FGC-162).*

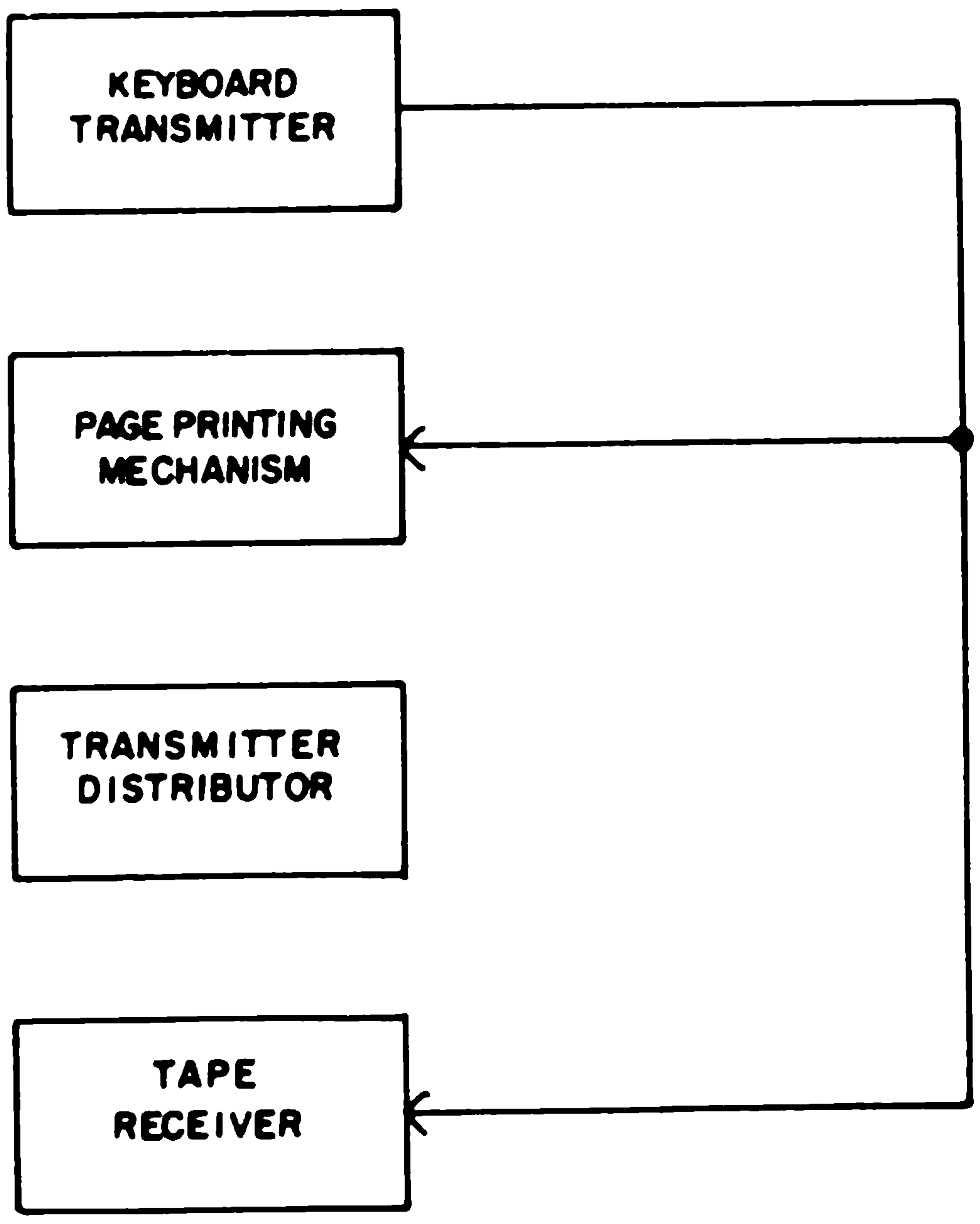

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*Figure 2-52. Block diagram for terminal box patching condition A, operation 8 (AN/FGC-161 and AN/FGC-162).*

*b. Typical Operational Possibilities for Terminal Board Patching Condition B.*

| Operation desired | Terminal board connections | |
|---|---|---|
| | From | To |
| 1. Transmit to send line from transmitter-distributor while monitoring send line with tape receiver. Use page-printing mechanism to receive from receive line (fig 2-54). | Perforator XMTR OUTPUT, terminals 4 and 5.<br>Perforator XMTR OUTPUT MON, terminals 6 and 7. | Send line.<br>Perforator RCVR INPUT terminals 9 and 10. |
| *a.* Transmit to send line from keyboard-transmitter while monitoring send line with tape receiver. Use page-printing mechanism to receive from receive line. | Page printer RCVR INPUT, terminals 9 and 10. | Receive line. |
| 2. Transmit to send line from transmitter-distributor while monitoring send line with page-printing mechanism. Use tape receiver to receive from receive line (fig. 2-55). | Perforator XMTR OUTPUT, terminals 4 and 5.<br>Perforator XMTR OUTPUT MON, terminals 6 and 7.<br>Perforator RCVR INPUT, terminals 9 and 10. | Send line.<br>Page printer RCVR INPUT, terminals 9 and 10. |
| *a.* Transmit to send line from keyboard-transmitter while monitoring send line with page-printing mechanism. Use tape receiver to receive from receive . | | |
| 3. Transmit from keyboard-transmitter to page-printing mechanism and tape receiver. | Perforator XMTR OUTPUT, terminals 4 and 5.<br>Perforator XMTR OUTPUT MON, terminals 6 and 7. | Page printer RCVR INPUT, terminals 9 and 10.<br>Perforator RCVR INPUT, terminals 9 and 10. |
| *a.* Transmit from keyboard-transmitter to tape receiver via simultaneous circuit. | | |
| *b.* Transmit from transmitter-distributor to page-printing mechanism and tape receiver. | | |

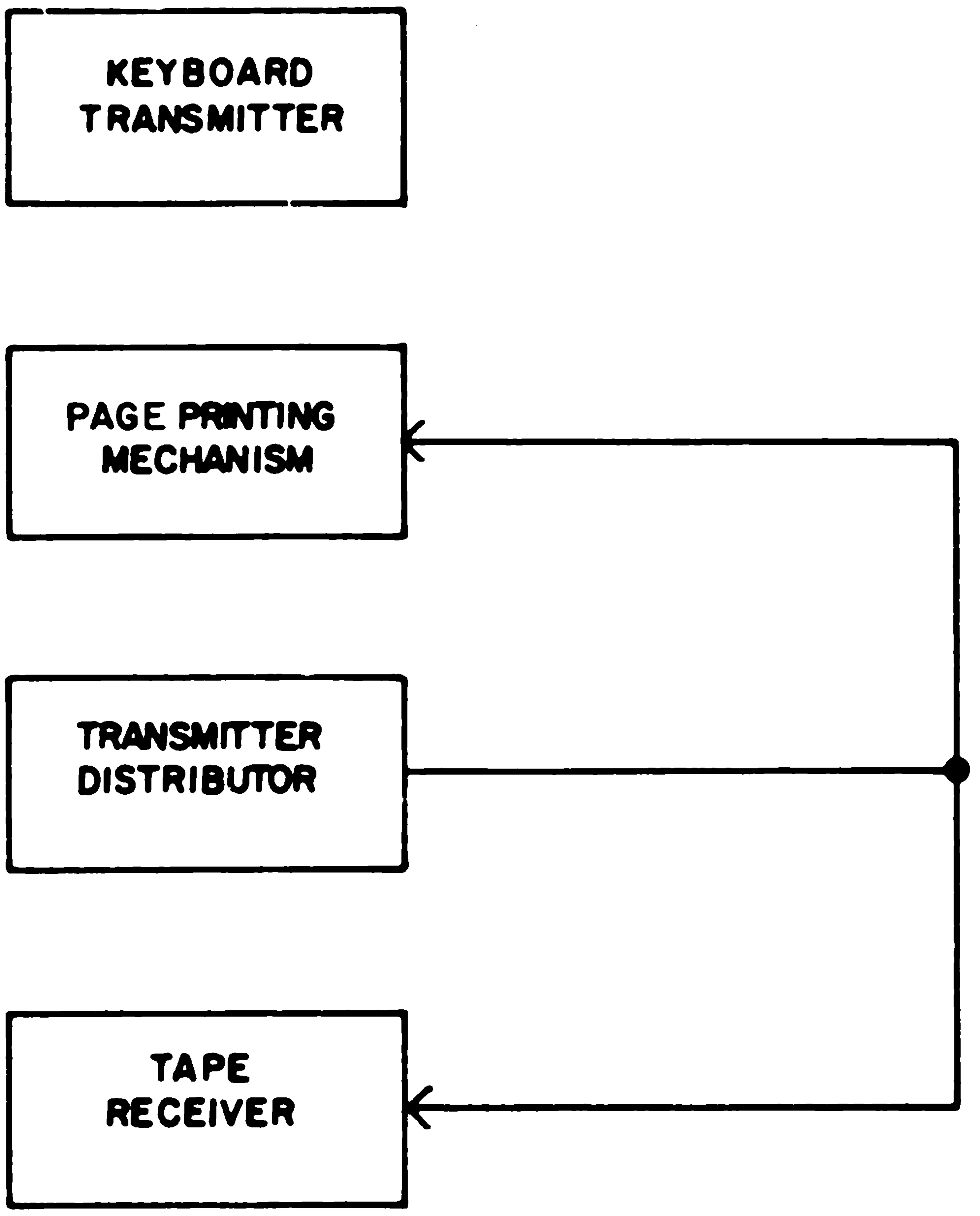

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*Figure 2-53. Block diagram for terminal box patching condition A, Operation 9 (AN/FGC-161 and AN/FGC-162 ).*

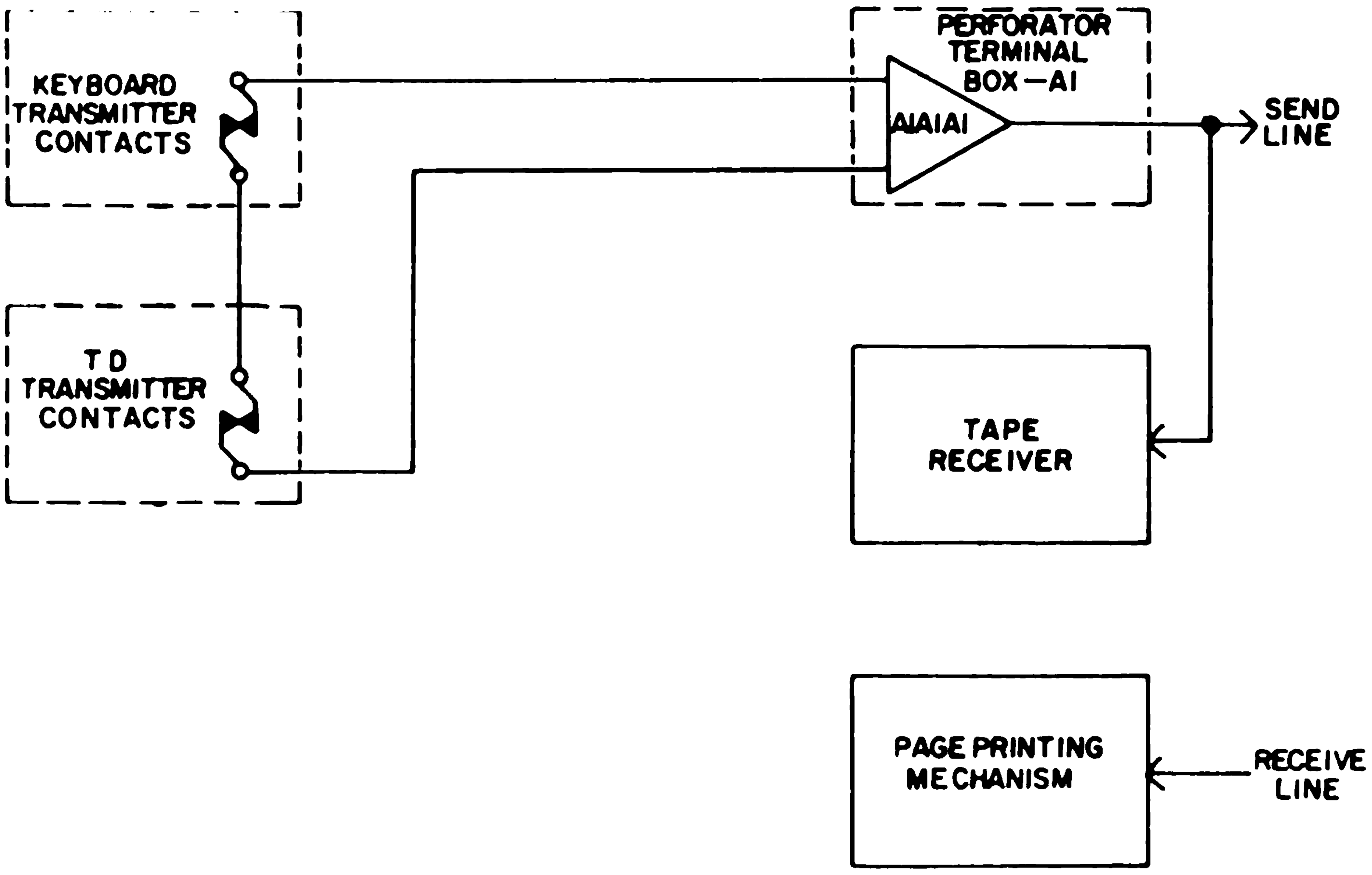

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*Figure 2-54. Block diagram for terminal box patching condition B, operation 1 (AN/FGC-161 and AN/FGC-162 ).*

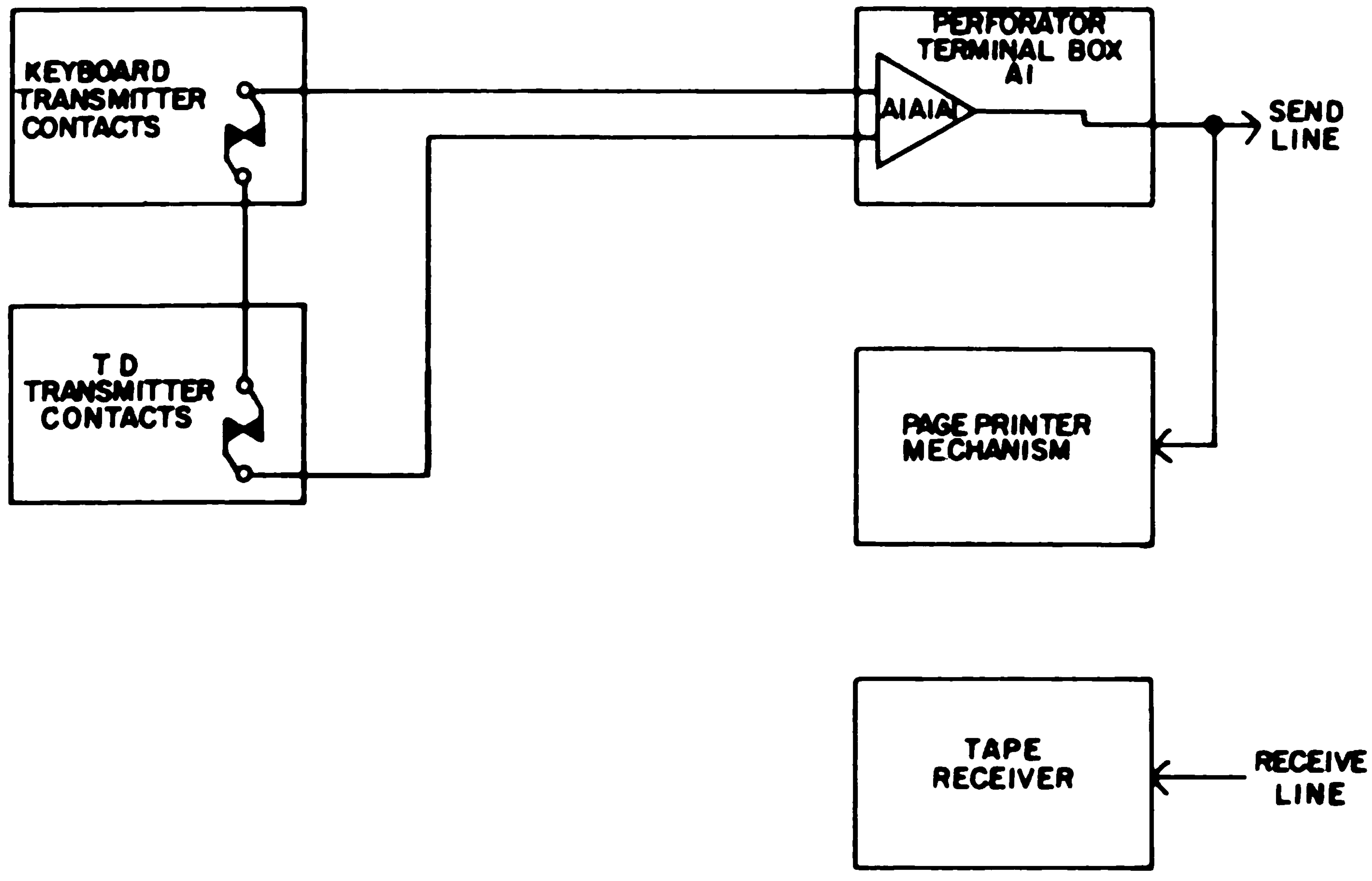

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*Figure 2-55. Block diagram for terminal box patching condition B, operation 2 (AN/FGC-161 and AN/FGC-162 ).*

## 2-27. Changing Teletypewriter Operating Speed (AN/FGC-161 and AN/FGC-162

The operating speed data given in paragraph 2-16 is also applicable to the AN/FGC-161 and AN/FGC-162. Specific data for the AN/FGC-25 is applicable to the AN/FGC-161; the AN/FGC-52 to the AN/FGC-162; the TT-269/FG to the TT-668/FG, TT-668A/FG, and TT-668B/FG; and the TT-270/FG to the TT-669/FG and TT-669A/FG.

## 2-28. Circuit Line-up Procedures (AN/FGC-161 and AN/FGC-162).

*a.* The teletypewriter sets are designed to transmit or receive ± 6 Vdc polar signals only. To secure the best possible machine operation, it is necessary to adjust the range of the teletypewriter set periodically. Circuit lineup consists of adjusting the rangefinder dial assemblies for the equipment at both ends of the circuit, followed by an exchange of test copy. Before the equipment is installed on the line, it is necessary for all personnel concerned to know the type of operation required.

*b.* The circuit from which the circuit lineup is directed is called the control station. Generally the station of higher authority is the control station. Lineup of a circuit of equal authority is normally directed by the station that has the lowest numerical designation.

*c.* The rangefinder dial assemblies (figs. 2-21 and 2-22) are adjusted as follows:

(1) Noncontrol stations transmit repeated R and Y signal code groups. The control station then turns its rangefinder dial assembly to the maximum and minimum good copy position. If the machine continues to receive good copy when the rangefinder dial assembly is set at zero, use zero as the low reference point. Determine the midpoint between the two settings and adjust the rangefinder dial assembly to this point. Both page printer and perforator rangefinders are adjusted in this manner.

(2) The control station now transmits repeated R and Y signal code groups while the noncontrol stations adjust the rangefinders in the same manner as the control station described in (1) above.

(3) The stations then exchange test messages. The messages must be correctly received.

# CHAPTER 3

# OPERATING INSTRUCTIONS

## Section I. OPERATOR'S CONTROLS AND INDICATORS

> NOTE
> This section covers only items used by the *operator;* items used by maintenance personnel are covered in instructions for the appropriate maintenance category.

### 3-1. Page Printer Controls and Indicators

The following charts list all controls and indicators used in operation of the page printer. Each unit includes a keyboard-transmitter and a page-printing mechanism. Operating personnel should become familiar with the location and operation ot each control before attempting to operate the equipment.

*a. Keyboard-Transmitter Controls.*

| Control | Figure ref | Location | Function |
|---|---|---|---|
| MOTOR switch | 3-1 | Left side of keyboard guard | Turns motor on and off for initial starting and complete shutdown of the page printer. |
| LIGHT switch | 3-1 | Left side of keyboard guard | Turns copy lamp on and off. |
| SEND-LOCK switch | 3-1 | Right side of keyboard guard | LOCK position; prevents keyboard transmission.<br>SEND position; allows transmission. |
| LINE BREAK switch | 3-1 | Right side of keyboard guard | Opens signal line when held at BREAK; used to start motors following motor stop. |
| End-of-line indicator light | 3-1 | Right side of keyboard guard | Lights when the carriage reaches the 66th space to indicate that end of the line is near. |
| FIGS key | 3-2 | Bottom row, extreme left-hand end of keyboard. | Shifts the platen to uppercase position to allow typing of numerals, punctuation marks, and other characters or performance of function designated above the letters on the alphabet keys. |
| LTRS keay | 3-2 | Bottom row, third from right-hand end of keyboard. | Returns platen to lowercase position to allow typing of letters. Has no effect except when struck after FIGS key has been struck. |
| LINE FEED key | 3-2 | Bottom row, second from right-hand end of keyboard. | Moves the paper up one or two lines spaces on the platen depending on the position of the single-double line feed lever. |
| CAR. RET. key | 3-2 | Middle row, extreme right-hand end of keyboard. | Returns the carriage (type basket) to the extreme left margin of paper. |
| BELL key | 3-2 | Middle row, second from left-hand end of keyboard. | Rings the signal bell to call the distant operator's attention when struck after the FIGS key. |
| STOP key [a] | 3-1 | Middle row, fifth from right-hand end of keyboard. | Turns off the motor to place machine on a standby basis when struck after the FIGS key. |
| REPEAT key | 3-1 | Top row, extreme right-hand end of keyboard. | When the repeat key together with any character of function key except CAR. RET. are struck and held down, the character of function is repeated until the repeat key is released. |
| Alphabet keys | 3-1, 3-2 | Keyboard | Causes the transmission of the code group with which it is associated. |
| Blank key | 3-1 | Bottom row, extreme right-hand end of keyboard. | Transmits blank code group used in message headings. Also used in preparing weather equipment for motor stop. |
| Space bar | 3-1 | In front of bottom row of keys | Causes carriage to move one space to the right without printing; permits spacing between words in a message. |
| Tab crank arm | 3-3 | At left of tabulator mechanism | Allows operator to set the tab set levers when pulled forward. |
| Tab set levers | 3-3 | Spaced along the tabulator mechanism above the keyboard. | When pulled down and forward, causes tabulating action in response to SPACE-REPEAT code impulses from the keyboard provided the tabulator locking lever is in the operative position. |

| Control | Figure ref | Location | Function |
|---|---|---|---|
| Tabulator locking lever | 3-3 | At the right side of the tabulator mechanism. | Causes carriage to stop at present tab set levers when pulled forward and up. Has no effect in the down position. |
| Character counter | 3-3 | Above the top row of keys | Indicates the number of code groups perforated in the tape since the CAR. RET. key was last depressed. |
| Keyboard control lever [b] | 3-4 | Above and to the right of the tabulator assembly. | Blocks keyboard transmission to the line when moved to right side. Permits transmission to the line when at left. |

[a] Not applicable to Teletypewriters TT-666 FG, TT-666A FG, TT-666B FG, TT-668A FG, and TT-668B FG.
[b] Not applicable to Teletypewriters TT-117 FG, TT-119 FG and TT-66 FG.

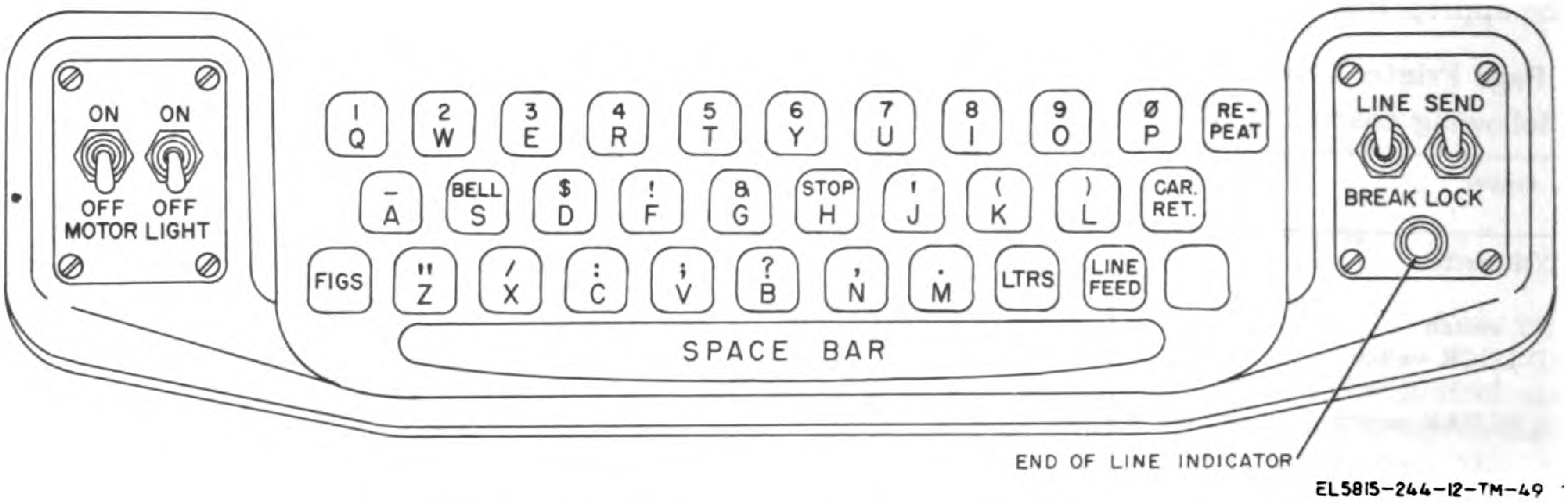
ON ON
OFF OFF
MOTOR LIGHT
1 Q, 2 W, 3 E, 4 R, 5 T, 6 Y, 7 U, 8 I, 9 O, Ø P, RE-PEAT
— A, BELL S, $ D, ! F, & G, STOP H, ' J, ( K, ) L, CAR. RET.
FIGS, " Z, / X, : C, ; V, ? B, , N, . M, LTRS, LINE FEED
SPACE BAR
LINE SEND
BREAK LOCK
END OF LINE INDICATOR
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*Figure 3-1. Keyboard guard and keylevers (standard communications).*

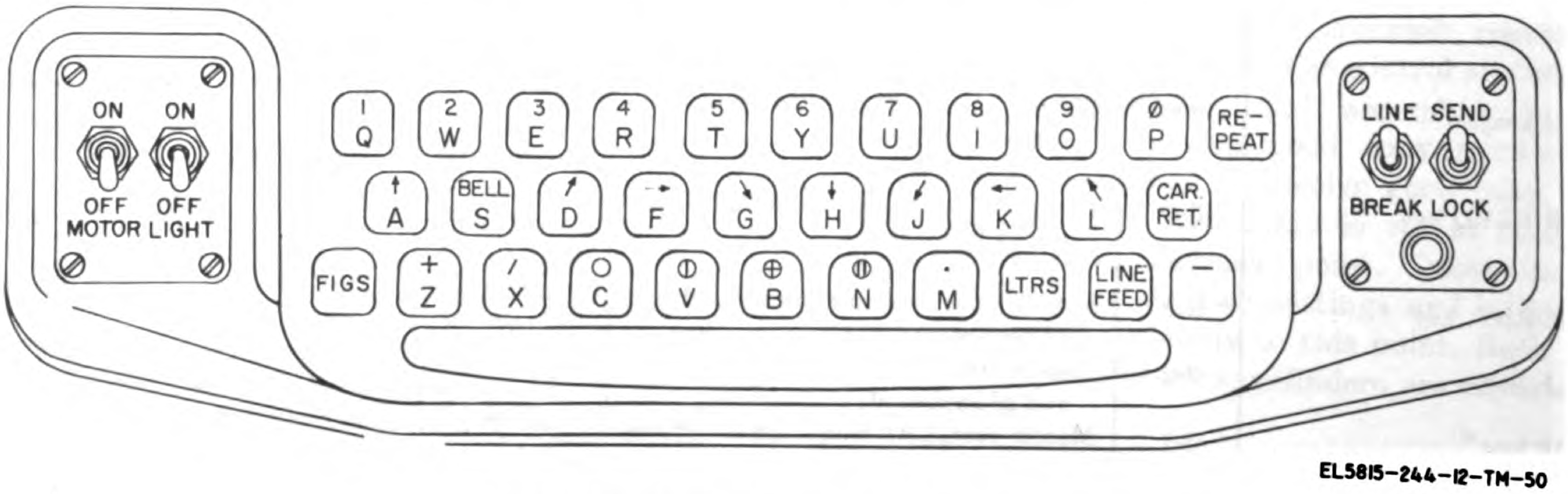
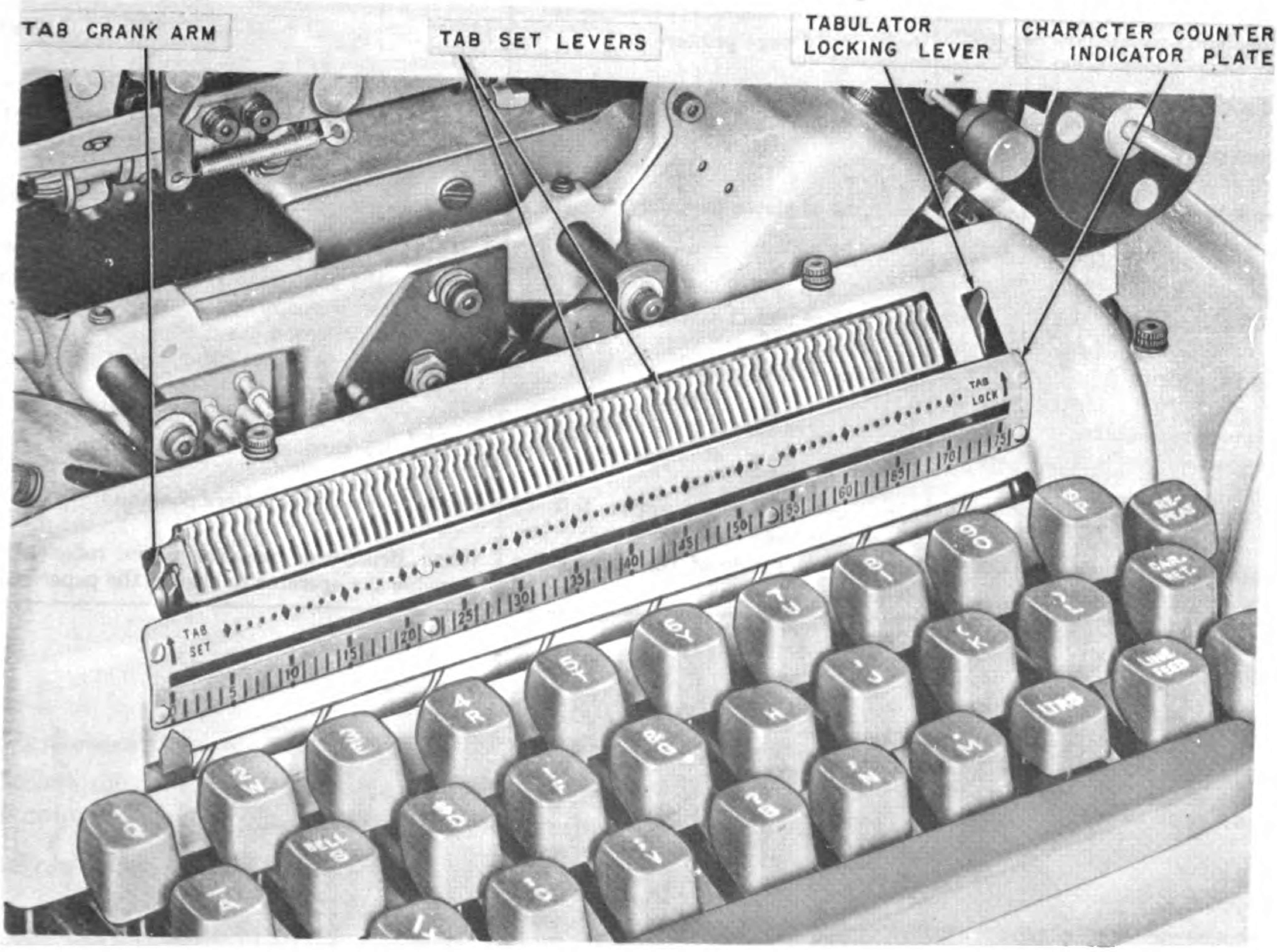
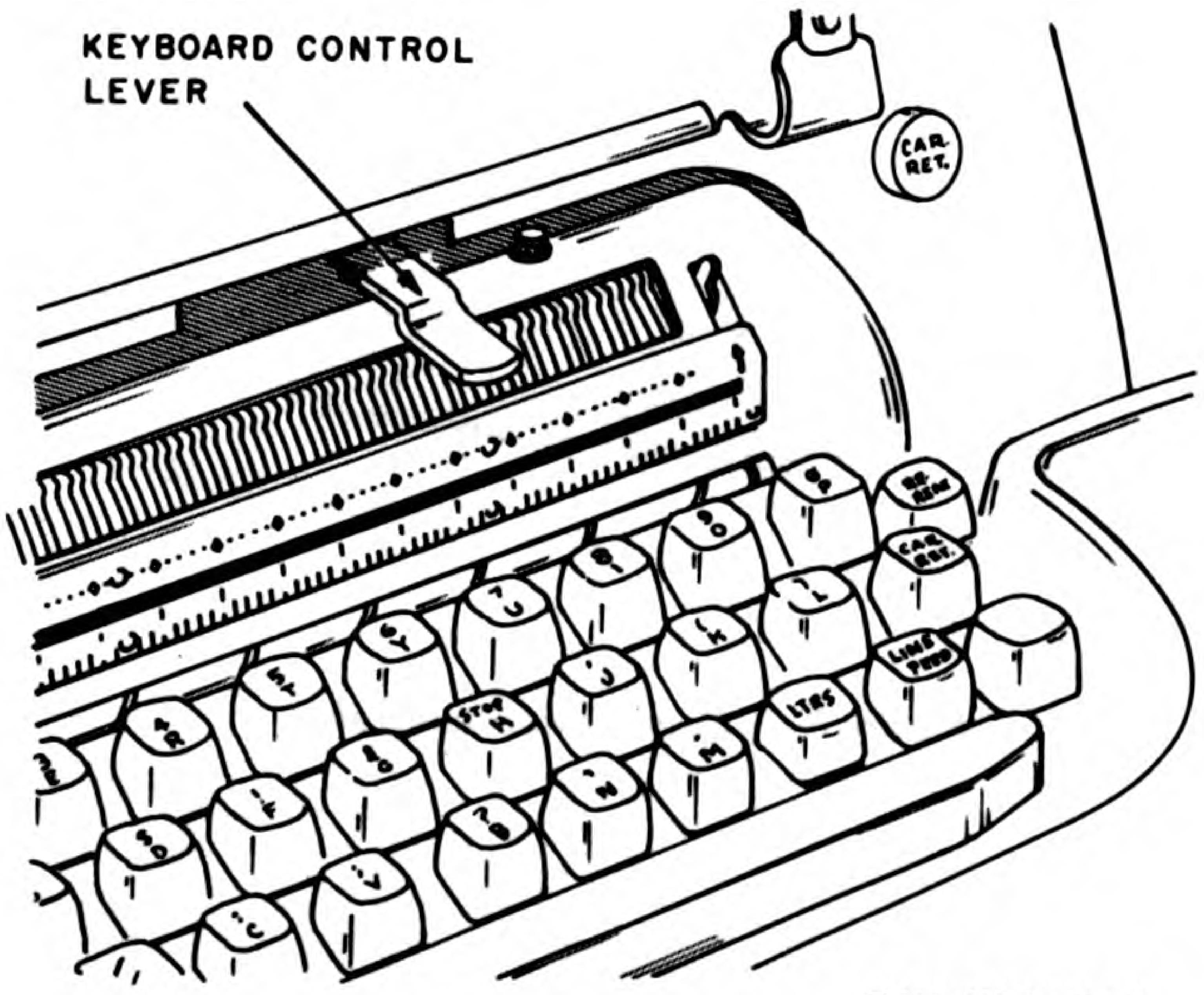

ON ON
OFF OFF
MOTOR LIGHT
1 Q, 2 W, 3 E, 4 R, 5 T, 6 Y, 7 U, 8 I, 9 O, Ø P, RE-PEAT
↑ A, BELL S, ↗ D, → F, ↘ G, ↓ H, ↙ J, ← K, ↖ L, CAR. RET.
FIGS, + Z, / X, ○ C, ⦶ V, ⊕ B, ⦶ N, · M, LTRS, LINE FEED, —
LINE SEND
BREAK LOCK
EL5815-244-12-TM-50

*Figure 3-2. Keyboard guard and keylevers (weather communications).*



EL5815-244-12-TM-51

Figure 3-3. Tabulator controls.



EL5815-244-12-TM-52

Figure 3-4. Keyboard control lever (all models, excpet TT-117/FG and TT-119/FG ).

*b. Page-Printing Mechanism Controls.*

| Control | Figure ref | Location | Function |
|---|---|---|---|
| Platen crank | 3-5 | Left side of page printer | Rolls the paper from the platen so that the message can be torn off. |
| Single-double line feed lever. | 3-5 | At left of platen assembly | Causes the platen to move one space for line feed operation in forward position. Causes the platen to move two spaces for line feed operation in the rear position. |
| Pressure roller lever | 3-7 | At right of platen assembly | When pulled forward, releases pressure on the paper to allow straightening of paper or use of sprocket-feed paper. In the rear position, presses the paper tightly against the platen. |
| Platen lever latch | 3-5, 3-7 | At right of platen assembly | Locks, the pressure roller lever in either the applied or released position. |
| Sprocket cam plate | 3-6 | At both ends of platen | Feeds out the sprocket-feed pins for use with sprocket fed forms. |
| Manual space pushbutton | 3-7 | Behind right side of platen assembly. | Moves the carriage to the right. |
| Manual CAR. RET. button. | 3-5 | On dust cover at upper right of keyboard. | Returns the carriage to the left margin. |
| Manual LTRS button | 3-5 | On dust cover at upper left of keyboard. | Shifts platen to the letters position. |
| Paper roller latch | 3-7 | On the right side of the paper roller stand. | When depressed, releases paper roller shaft to enable the operator to change the paper roll. |

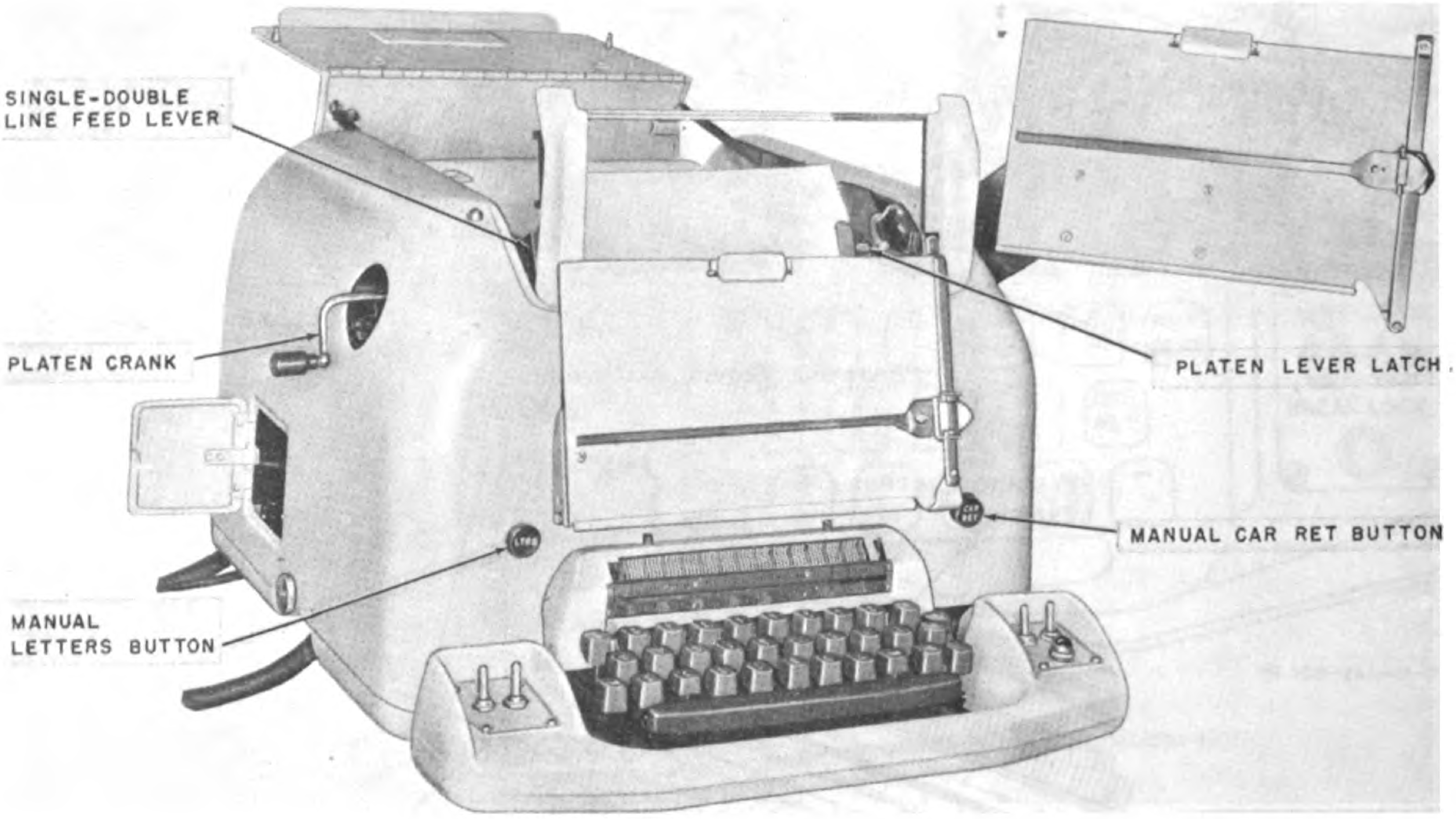


*Figure 3-5. Page printer controls.*

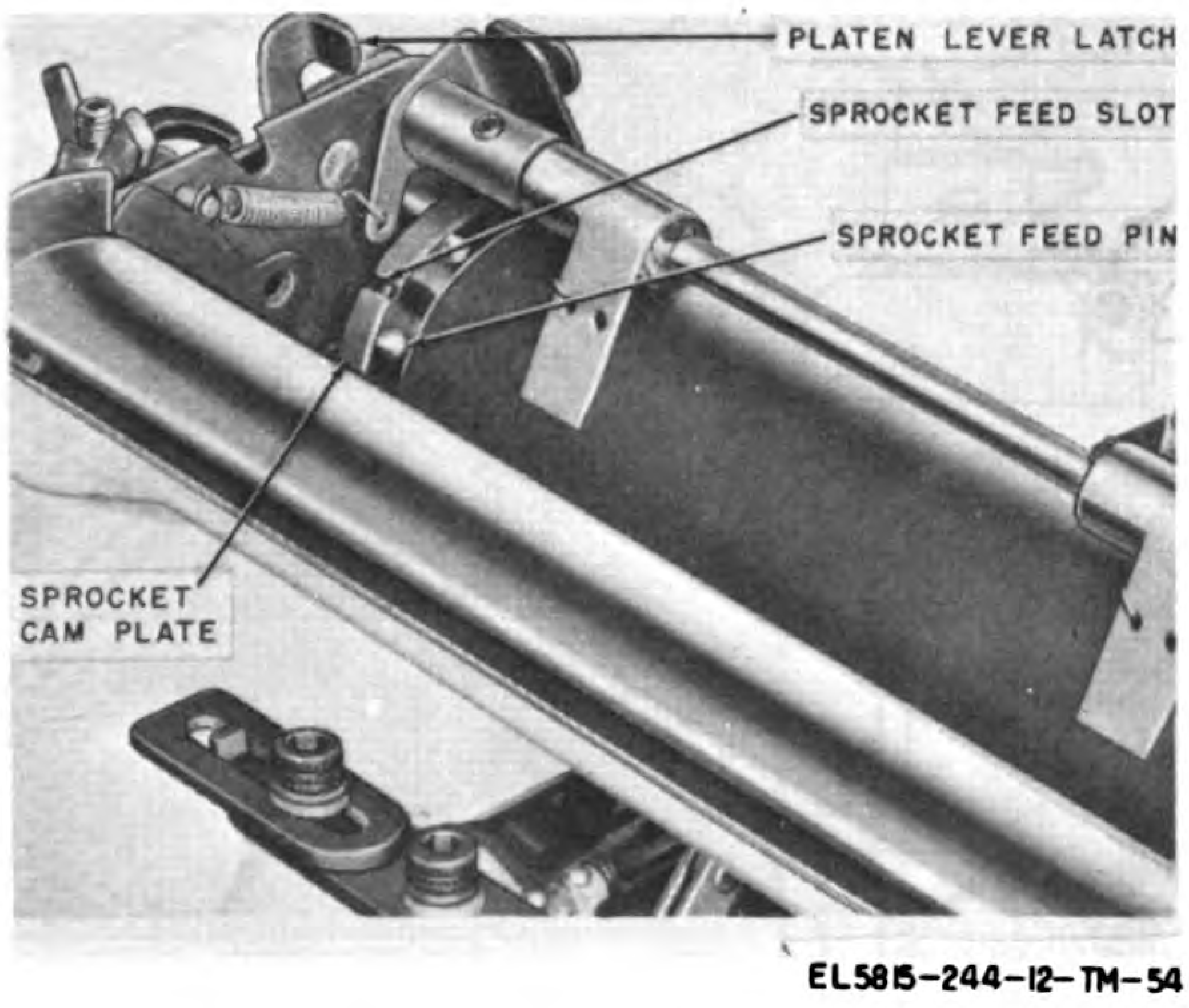


*Figure 3-6. Sprocket feed controls.*

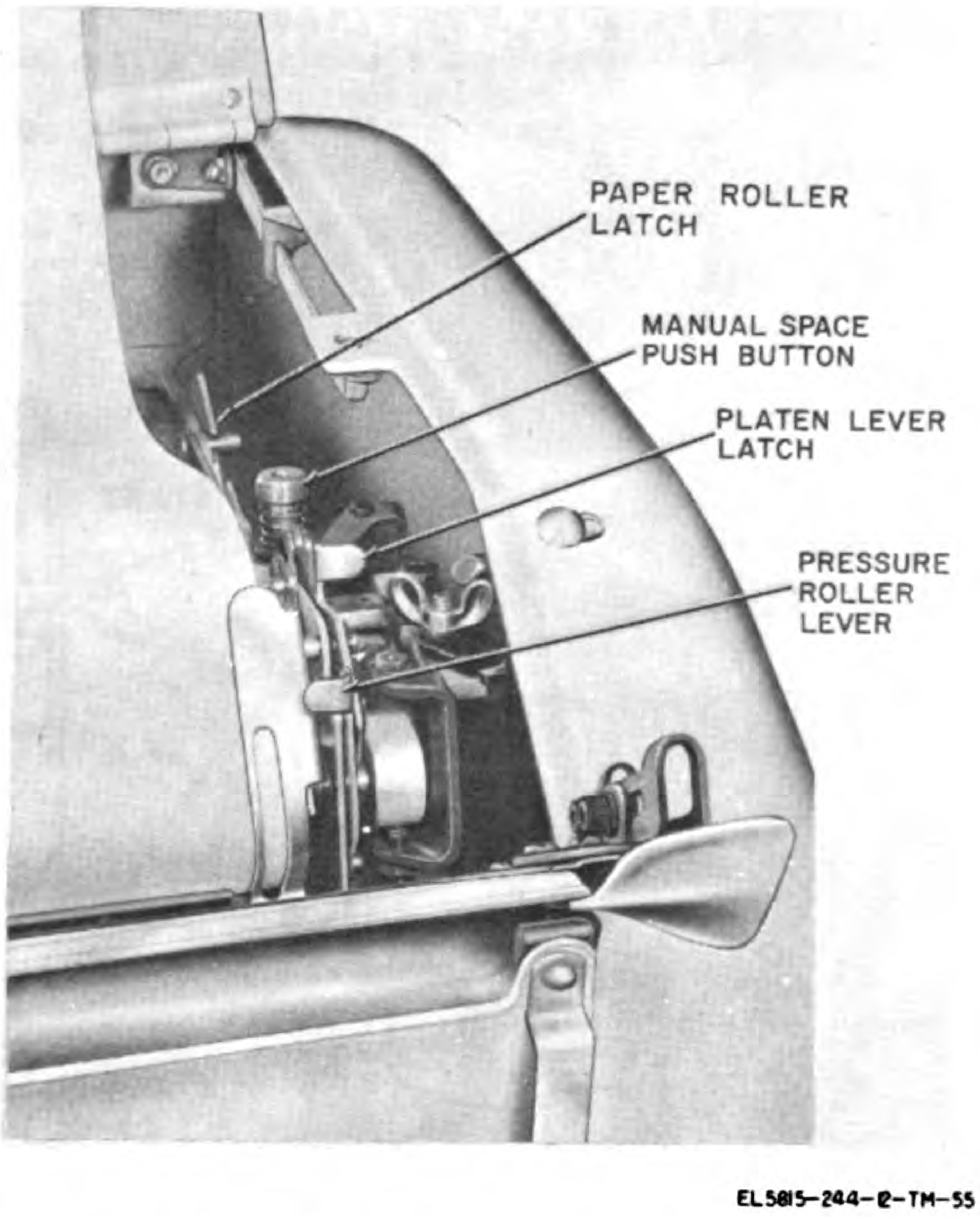


*Figure 3-7. Controls at right side of platen.*

### 3-2. Perforator Controls and Indicators

The following charts list the location and function of all controls used in operation of the perforator. Each unit includes a transmitter-distributor and a tape receiver.

*a. Transmitter-Distributor Controls (fig. 3-8).*

| Control | Location | Function |
|---|---|---|
| STOP-START lever | Left front side of transmitter-distributor cover. | START position: Allows a message to be transmitted from the transmitter-distributor.<br>STOP position: Stops transmission from the transmitter-distributor.<br>FEED RETRACT position: Retracts feed pins and permits a tape to be inserted into the transmitter-distributor. |
| Tight-tape lever | In front of the transmitter-distributor. | Stops transmission when tape becomes tight. When tape is slack, it allows the unit to transmit. |
| Tape-out lever | Under tape cover | Rises to stop transmission when the end of the tape is reached. |
| Tape cover latch | At right of tape cover | Raises the cover to permit tape adjustment and installation. |

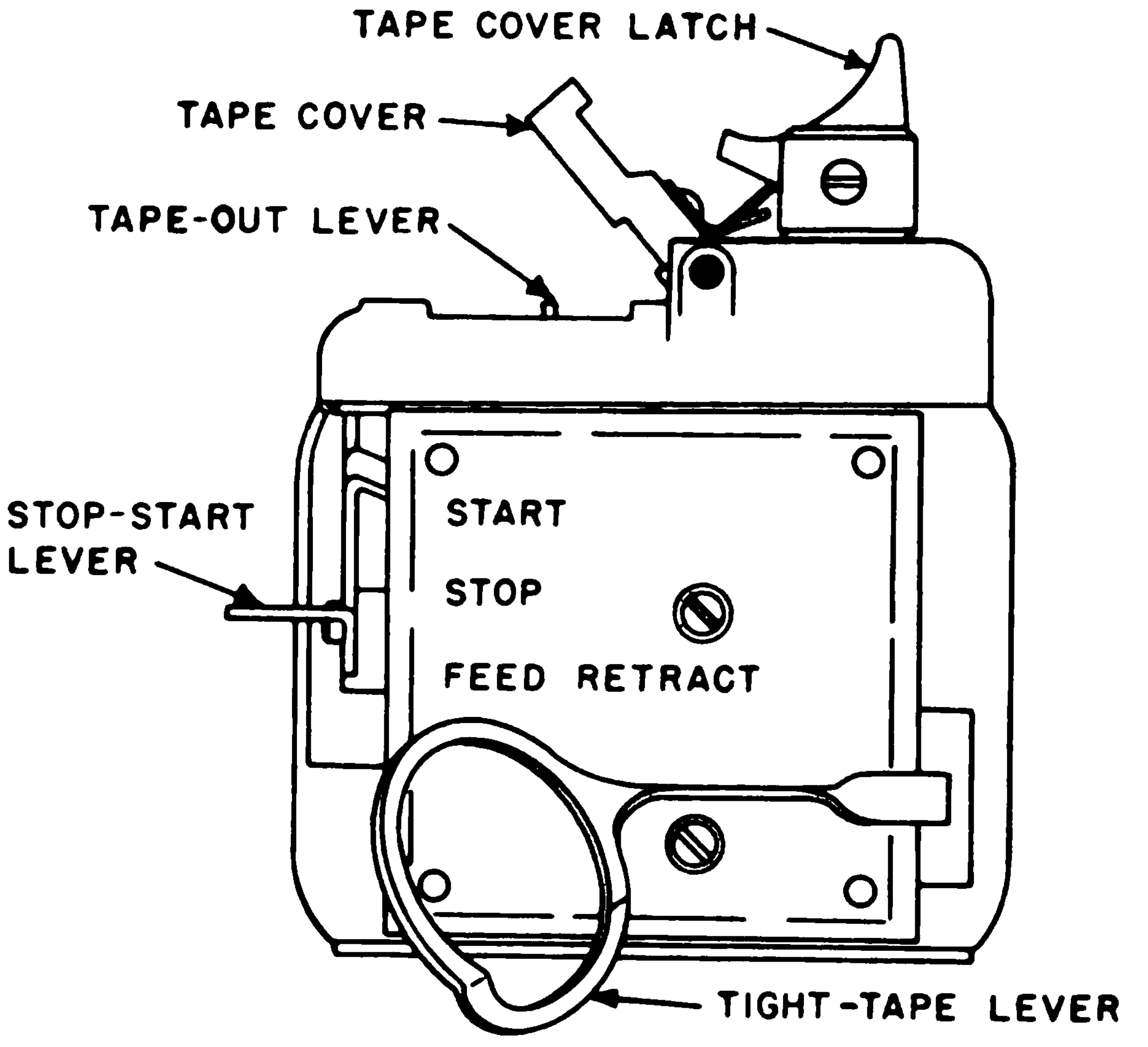


*Figure 3-8. Transmitter-Distributor controls.*

*b. Perforator Controls and Indicators* (fig. 3-9).

| Control | Location | Function |
|---|---|---|
| Keyboard control switch | At left of the switch plate on the front of perforator. | KEYBD, the left position of the switch, controls the sending of sequential signals from the keyboard-transmitter.<br>KEYBD AND TAPE, the center position of the switch, controls sending of both simultaneous and sequential signals from the keyboard-transmitter.<br>TAPE, the right position of the switch, controls sending of simultaneous signals from keyboard-transmitter to the perforator. |
| Perforator control switch | At the left center of the switch plate at the front of the perforator. | KEYBD, the left position of the switch, enable the perforator to receive simultaneous signals.<br>OFF, the center position of the switch, cuts off the reception of the perforator.<br>REPERF, the right position of the switch, enables the perforator to receive sequential signals. |
| MOTOR switch | In center of the switch plate at the front of the perforator. | Turns the perforator motor on or off. |
| Line switch key [a] | At the right center of the switch plate at the front of the perforator. | LINE 1, the left position of the switch, places line 1 in series with the equipment that is patched into LINE TEST SW on the patch panel.<br>TEST, the center position of the switch, places the equipment that is patched into LINE TEST SW on the patch panel in series with the local circuit.<br>LINE 2, the right position of the switch, places line 2 in series with the equipment that is patched into LINE TEST SW on the patch panel. |
| AIR MONITOR switch | At the right of the switch plate at the front of the perforator. | LINE 1, the left position of the switch, inserts the automatic line return into the line 1 signal circuit, enables the page-printing mechanism to record the line 1 signal.<br>OFF, the center position of the switch, takes the monitor out of the circuit.<br>LINE 2, the right position of the switch, inserts the automatic line return into the line 2 signal circuit, enabling the page-printing mechanism to record the line 2 signal. |
| Manual tape feed-out lever | At right of the perforator above switches. | When turned to left, causes the message tape to feed out of the perforator. |
| Tape back space lever | At left front corner of the perforator inside the dust cover. | When pressed, spaces tape to the right to permit correction of errors. |

[a] Not applicable tp Perforators TT-667/FG, TT-667A/FG, TT-667B/FG, TT-669/FG, and TT-669A/FG.

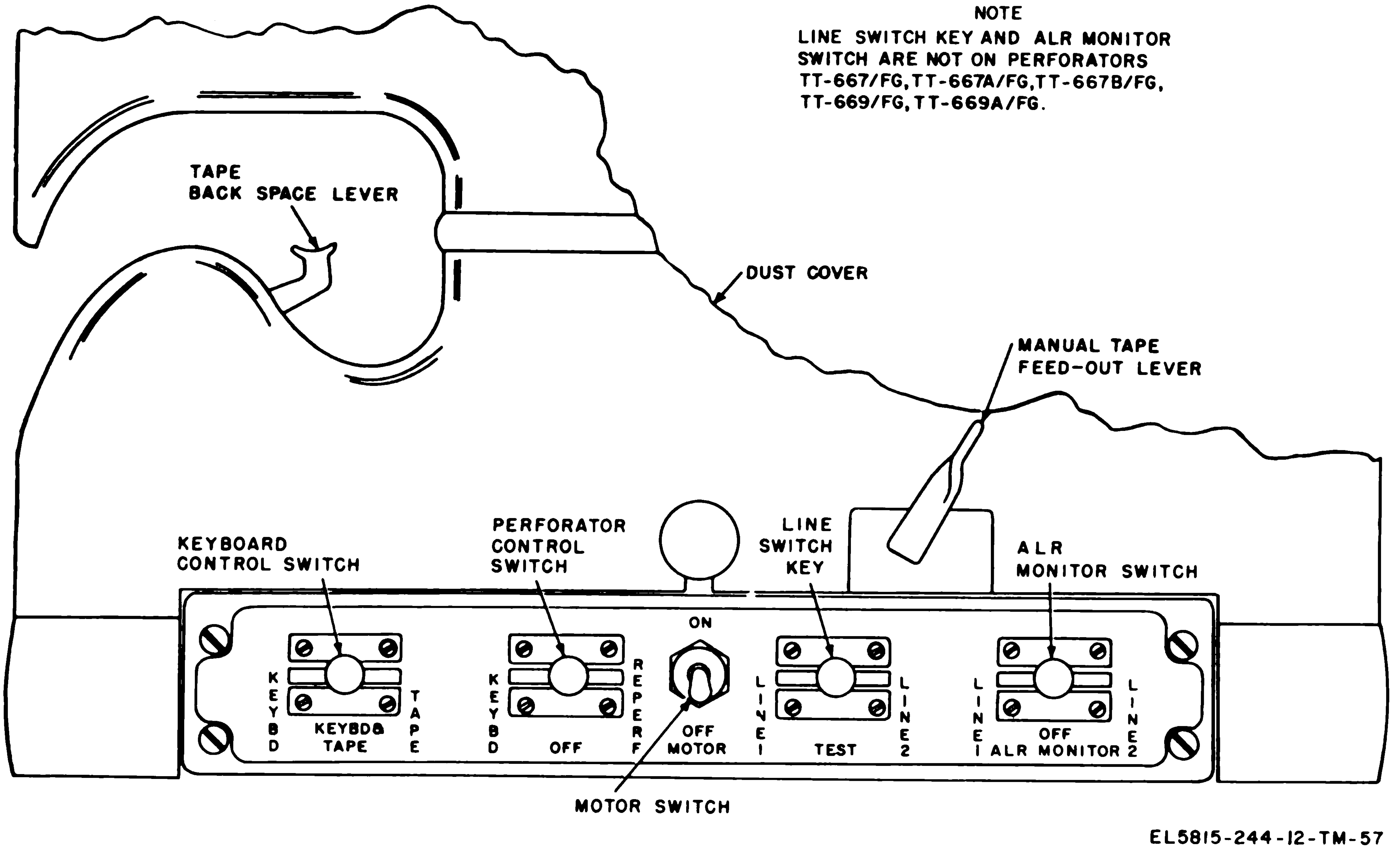

NOTE
LINE SWITCH KEY AND ALR MONITOR SWITCH ARE NOT ON PERFORATORS TT-667/FG,TT-667A/FG,TT-667B/FG, TT-669/FG,TT-669A/FG.

*Figure 3-9. Perforator controls.*

## Section II. OPERATION UNDER NORMAL CONDITIONS

### 3-3. Preliminary Starting and Checking Procedures

*a. Loading and Checking Roll Paper.* The page printer dust cover need not be removed before loading or unloading a paper roll or before checking the amount of paper on the roll.

(1) *Loading roll paper.*

(a) Unlatch the power copyholder from the dust cover by pulling the top edge of the copyholder away from the dust cover.

(b) Move the latch buttons (located on both sides of dust cover window) away from each other to release the top access window and move the window section forward.

(c) Move the top access door upward and then backward to its rearmost position (fig. 3-5).

(d) Remove the paper roller shaft from its mounting slots in the paper roller stand by pressing rearward on one of the paper roller latches (fig. 3-7) and pulling the paper roller shaft upward.

(e) Insert the shaft (fig. 3-10) into a paper roll.

(f) Replace the paper roller shaft in the slots. Be sure the paper when unwound from the roll, is drawn upward between the roll and the platen.

(g) Feed the paper into the rear of the platen assembly, threading it between the platen and the platen pressure roller. Turn the platen crank (fig. 3-5) counterclockwise until several inches of paper appear in front of the platen. Operate the pressure roller lever and center the paper on the platen. Be sure the paper feeds straight around the platen and is free from creases, twists, or wrinkles.

(h) Turn the platen crank until the end of the paper extends several inches above the dust cover.

(i) Close and latch the top access door and top access window, allowing the paper to extend out over the top. Latch the copyholder.

(2) *Checking paper.*

(a) Check the paper during operation of the page printer to make certain that it is centered, free from creases or wrinkles, and that it feeds upward between the window and door in the top of the dust cover. When it is necessary to center or straighten the paper, push downward on the pressure roller lever at the right end of the platen, center and straighten the paper, and return the pressure roller lever to the original position.

(b) When the end of the paper nears, a red stripe will appear at the center or side of the paper. This is a warning that the end of the paper roll is near and that the end of the paper roll is near and that the roll should be replaced before the receipt of another message. This warning is given early enough to permit reception of the complete incoming message before the end of the paper is reached.

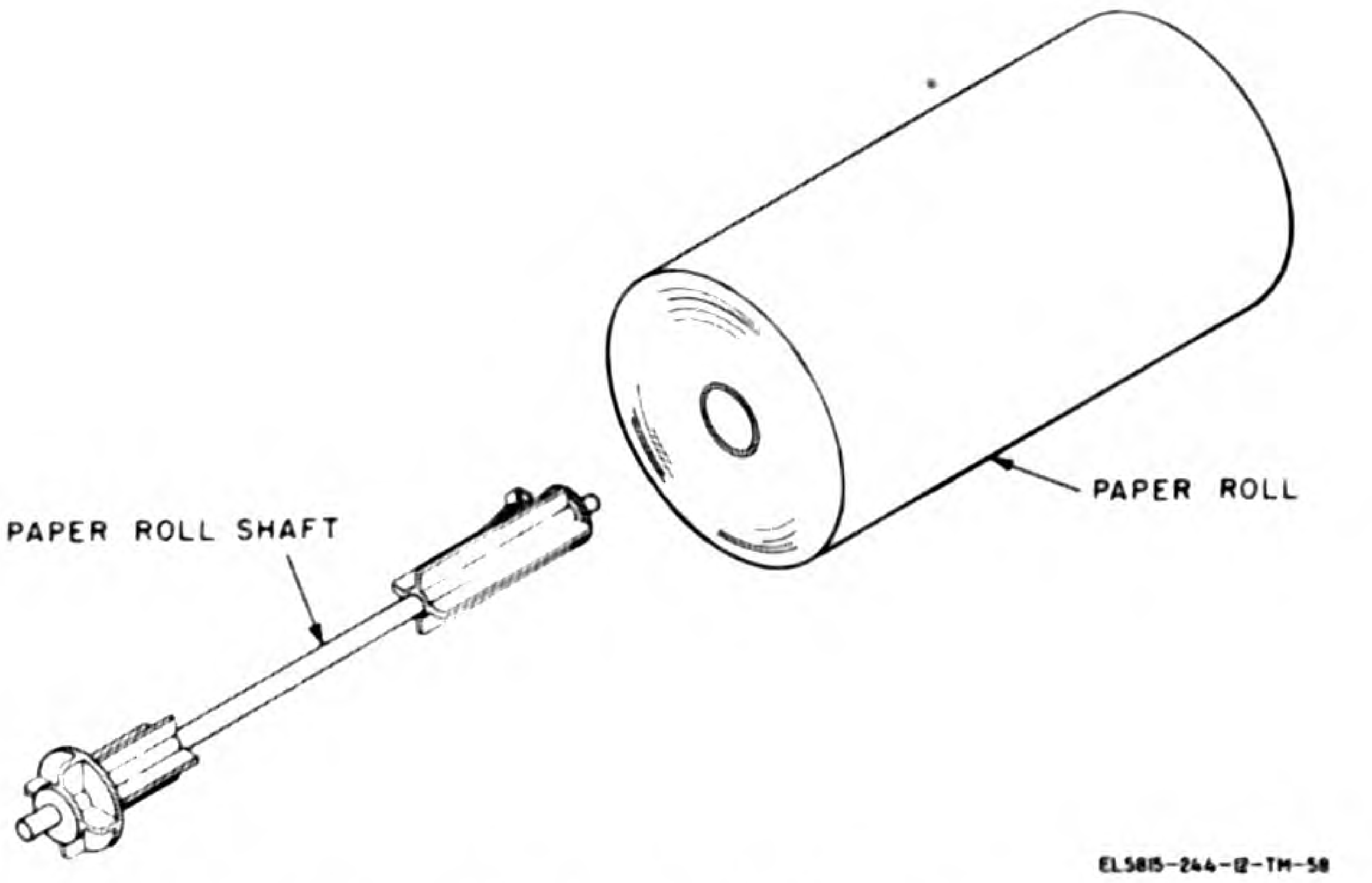


*Figure 3-10. Paper roller shaft and paper roll.*

*b. Installing Fanfold Paper in Page Printer* (fig. 3-11).

(1) Place a box of fanfold paper on the fanfold form rack.

(2) Thread the loose end of the paper upward through the guide chute in the table. If the paper contains feed holes, perform steps *c* (1) through (4) below; otherwise perform (3) below.

(3) Bring the paper over the top of the page-printing mechanism and thread it into the rear end of the platen assembly, between the platen and the pressure roller. Straighten the paper and replace the dust cover (*a* above).

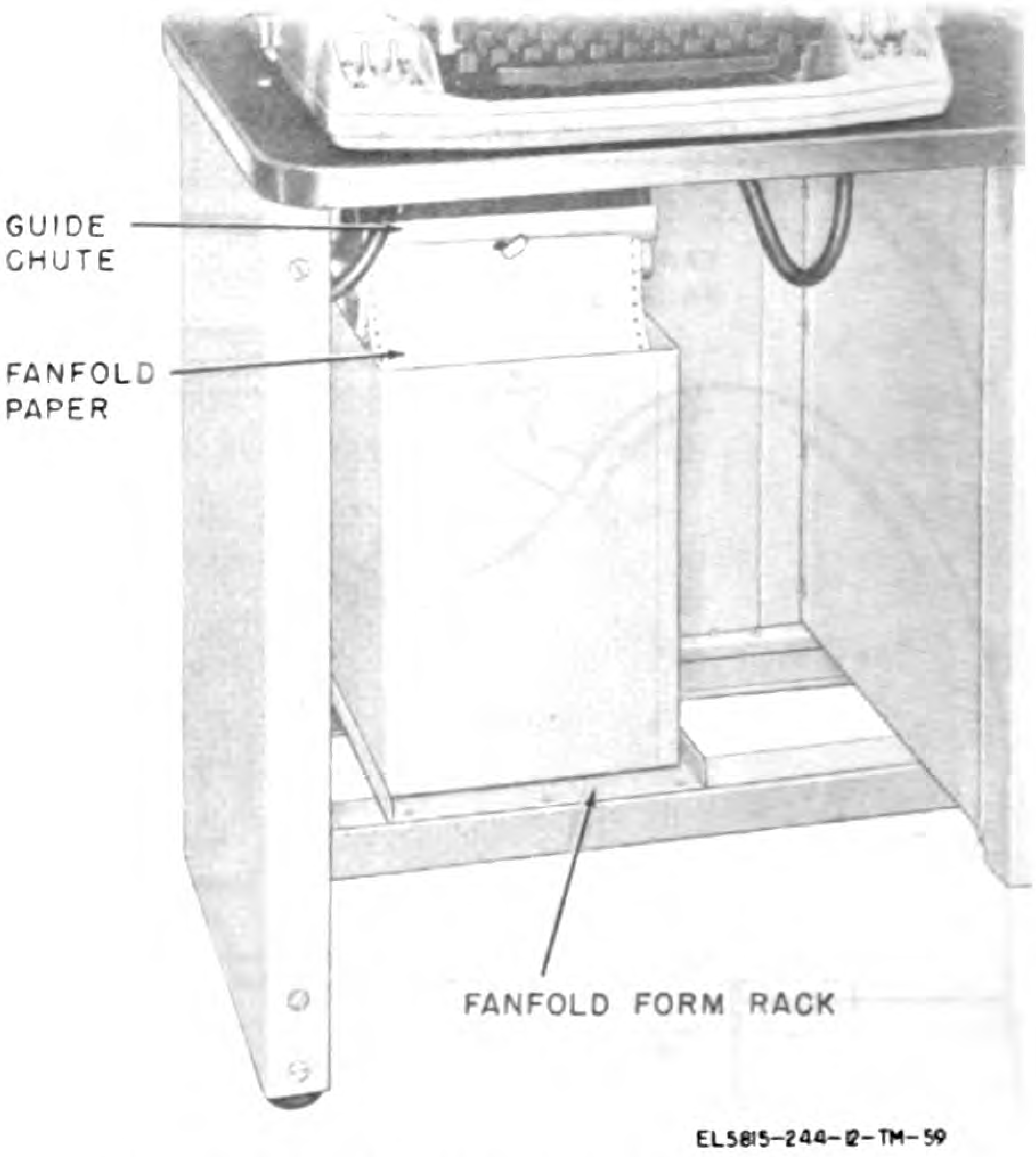


*Figure 3-11. Fanfold paper placed in table.*

*c. Installing Sprocket-Fed Forms.*

(1) Insert a screwdriver into the sprocket feed slot in the sprocket cam plate (fig. 3-6) at the ends of the platen and turn the sprocket cam plate until the sprocket feed pins protrude fully from the platen assembly.

(2) Release the pressure roller lever.

(3) Install the pack of fanfold sprocket-fed forms in the table as directed in *b* (1) and (2) above.

(4) Thread the end of the paper into the platen (fig. 3-12). Make certain that the sprocket feed pins mesh properly with the perforations along the edges of the paper.

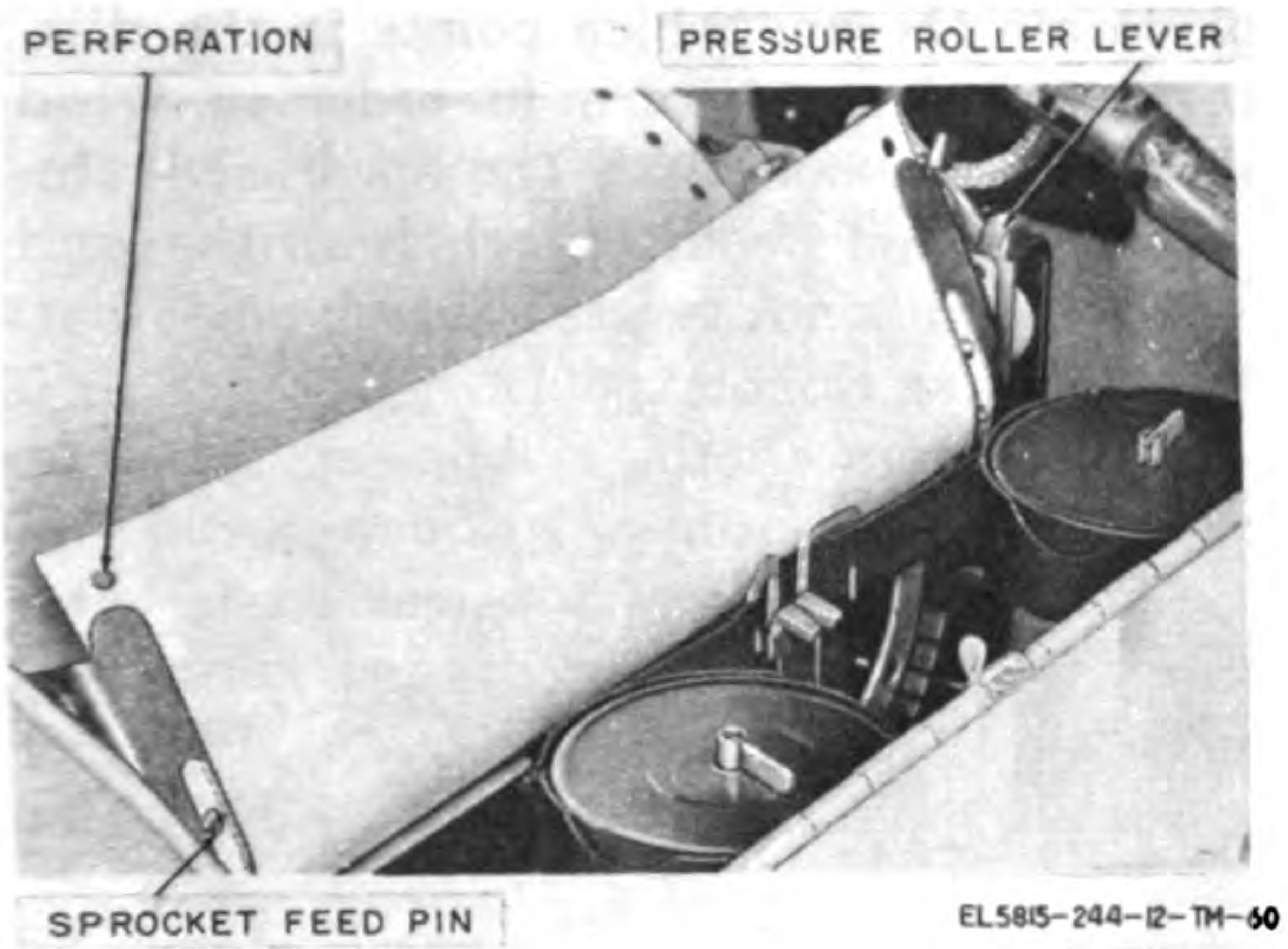


*Figure 3-12. Sprocket-fed paper threaded around platen.*

*d. Installing Tape in Perforator.* The perforator dust cover need not be removed for installation of a tape roll (fig. 3-13). To load tape roll, perform the following procedures:

(1) Move the top rear door of the perforator upward and open the front access door of the dust cover.

(2) Pull the tape alarm lever away from the hub of the tape reel and place the tape roll on the hub; then release the tape alarm lever, allowing the end of the tape alarm lever to rest against the tape roll. Guide the end of the tape through the tape guide.

(3) Feed the end of the tape from the tape guide (fig. 3-14) into the tape chute, under the type wheel, and into the slot in the code die assembly. Press down on the tape retainer assembly and feed the tape end under the roller and tape tear wire, and out through the opening in the dust cover.

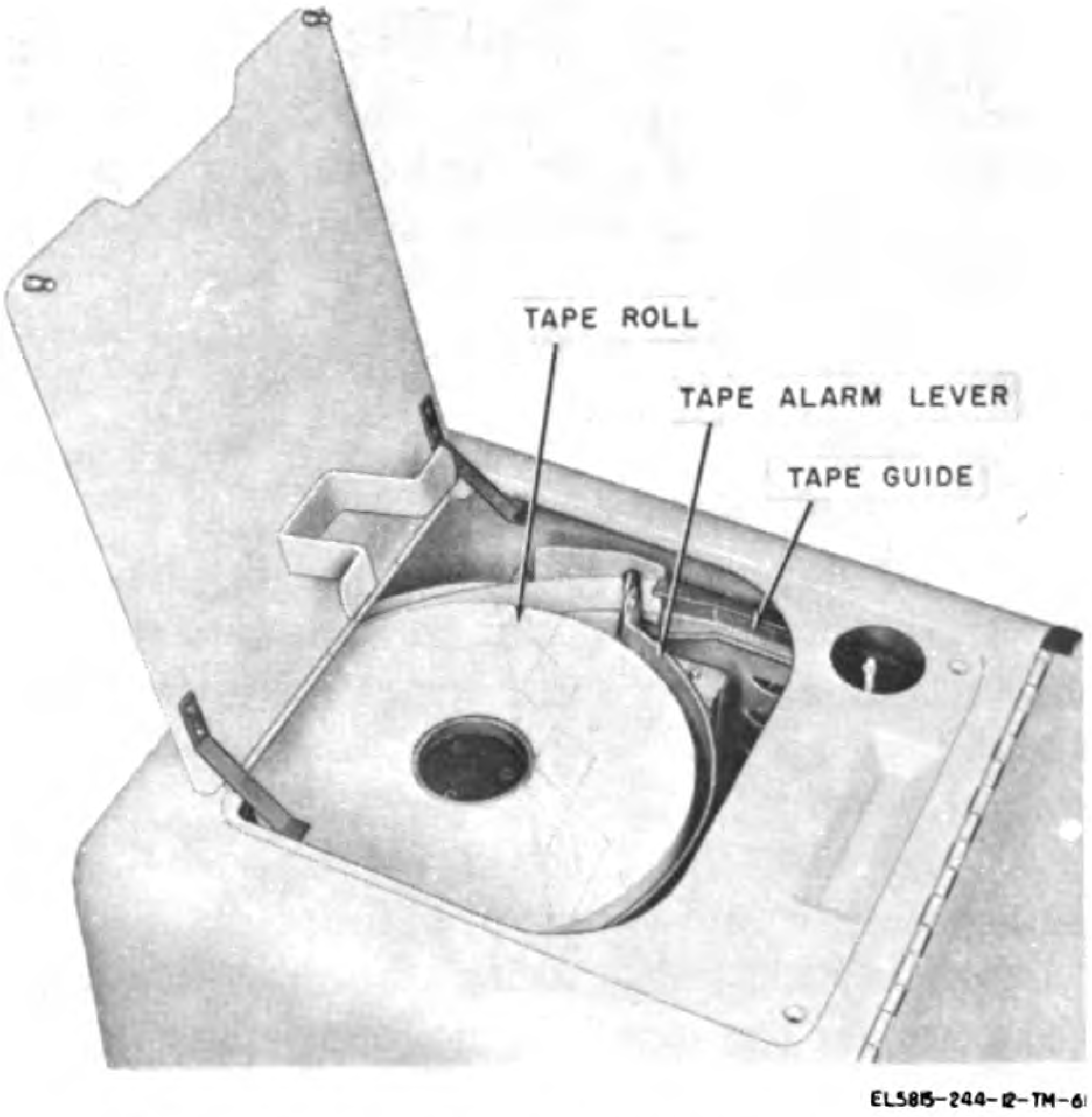


*Figure 3-13. Tape roll mounted in perforator.*

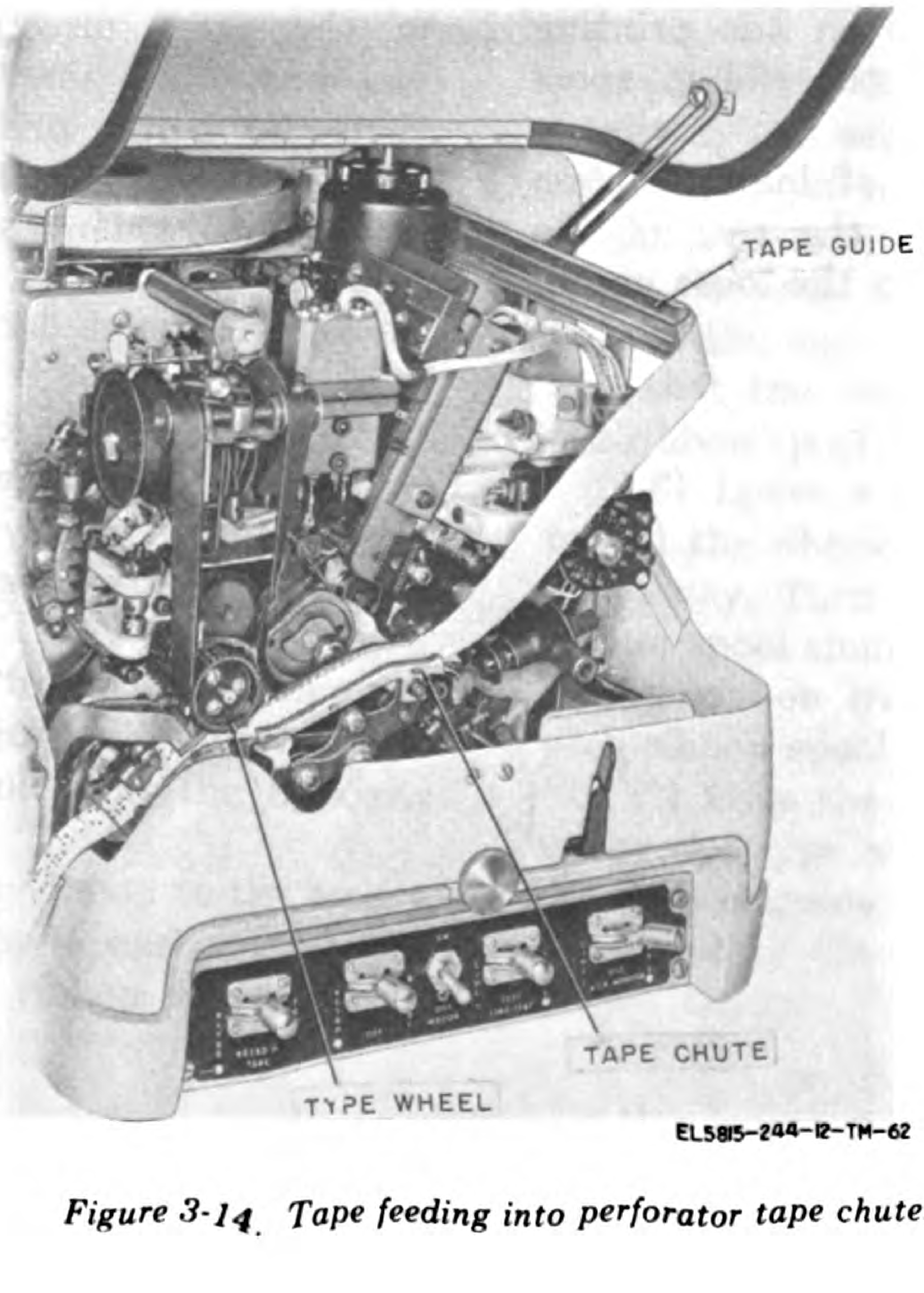


*Figure 3-14. Tape feeding into perforator tape chute.*

*e. Changing Inking Ribbon on Page Printer* (fig. 3-15). It is not necessary to remove the dust cover from the page printer when replacing the inking ribbon. To prepare the page printer, open the top access door (fig. 3-3) and top access window, turn the motor on; press the manual space pushbutton until the carriage is spaced to the center of the opening and stop the motor.

(1) Remove the old inking ribbon as follows:

(a) Wind one of the printing ribbon spools by hand. Hold one end of the ribbon reverse beam (located below type bars) midway between its upper and lower positions and twirl the appropriate ribbon spool lock until the other printing ribbon spool is empty.

(b) Remove the old inking ribbon from the slots in the ribbon guide.

(c) Turn the ribbon spool locks to the upright (unlocked) positions.

(d) Depress both ribbon sensing levers. Lift out the empty printing ribbon spool and detach the inking ribbon. Save the empty printing ribbon spool to wind the new inking ribbon. Release the ribbon sensing levers.

(e) Lift out the full printing ribbon spool and discard it and the worn inking ribbon.

(2) Install a new inking ribbon as follows:

(a) If the new inking ribbon must be turned counterclockwise to be unwound (when viewed from the top), place the new inking ribbon in the right-hand ribbon drive mounting. If it must be turned clockwise to be unwound (when viewed from the top), place it in the left-hand ribbon drive mounting. Aline the two holes in the printing ribbon spool with the lugs on the ribbon spool driven shaft collar.

(b) Pull about 12 inches of inking ribbon through the slotted opening in the rear of the ribbon drive mounting and fasten the loose end of the inking ribbon to the empty printing ribbon spool Of the spearhead fasteners on the empty spool, locate the one which points in the direction that the spool must turn in order to wind the ribbon on the spool. Stab the spearhead through the inking ribbon about 1 inch from the end. Be sure the ribbon is not twisted at any point between the two printing ribbon spools.

(c) Depress both ribbon sensing levers. Place the empty printing ribbon spool in the ribbon drive mounting as instructed for the full printing ribbon spool. Thread the inking ribbon through the slotted opening at the back of the ribbon drive mounting. Release the ribbon sensing levers.

(d) Insert the inking ribbon in the slots in the ribbon guide. Be sure that it is not twisted.

(e) Insert the inking ribbon in the slot on the back of each ribbon drive mounting. Pass the inking ribbon in front of the stop plate.

(f) Turn the two ribbon spool locks to the horizontal (locked) position.

(g) Tighten the inking ribbon by winding it manually. Turn one printing ribbon spool with one hand while holding the other spool rigid.

(3) After each inking ribbon installation, and at reasonable intervals, thereafter, make the following inking ribbon checks:

(a) Inking ribbon must be taut and free of twists, wrinkles, creases, holes, and tears. It must lie flat in the slots on the backs of the ribbon drive mountings and in the ribbon guide.

(b) Both printing ribbon spools must turn in the same direction while the page-printing mechanism is typing.

(e) Both printing ribbon spools must reverse direction when the unwinding printing ribbon spool is emptied.

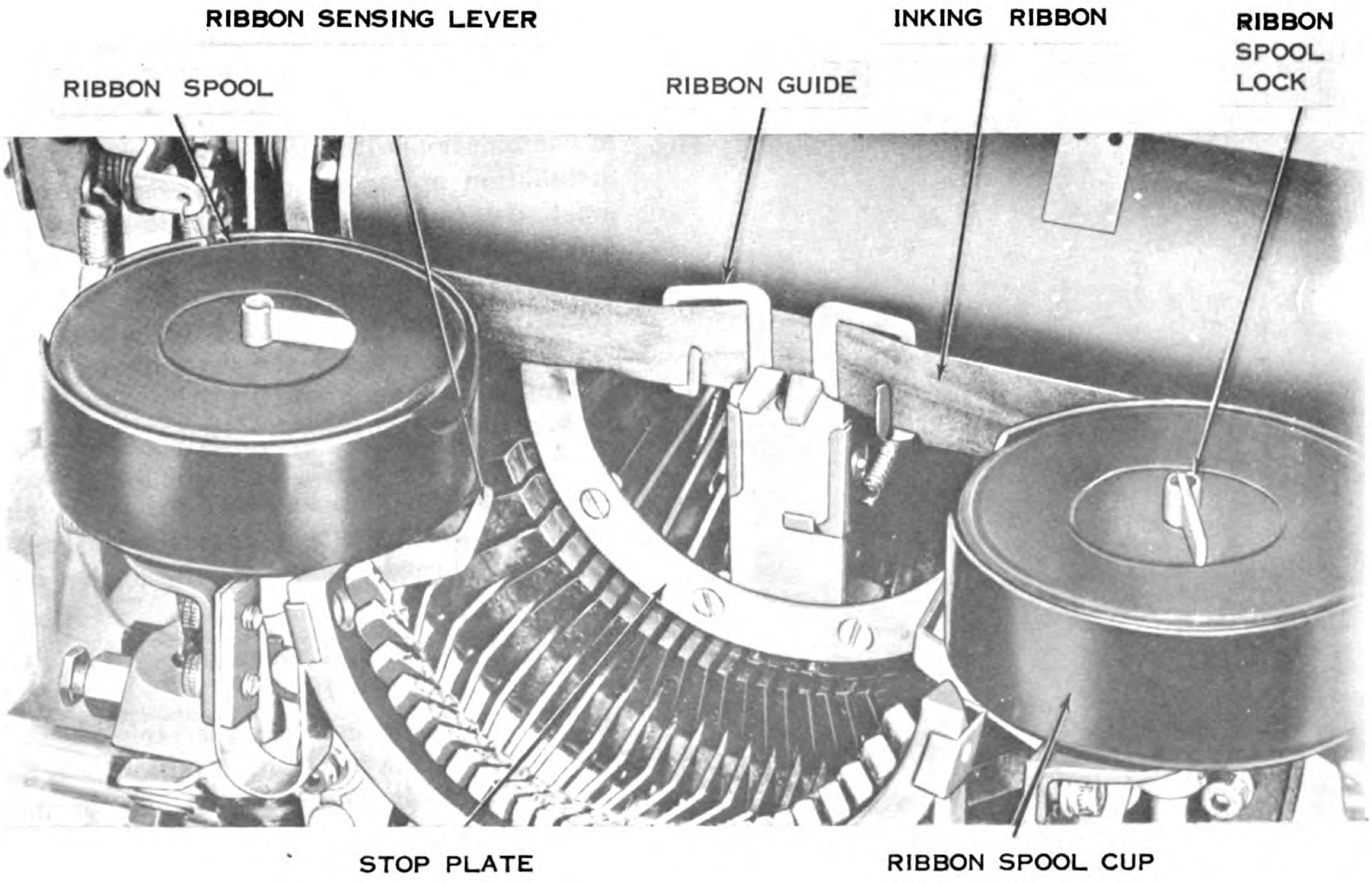


*Figure 3-15. Page printer inking ribbon mechanism.*

*f. Changing Inking Ribbon on Perforator* (fig. 3-16). Replace the inking ribbon when the fabric becomes worn or the printed characters lack the proper density for easy reading. Use the following procedure:

(1) Wind the inking ribbon completely on one ribbon spool.

(2) Move the ribbon spool locks on the ends of the ribbon spool shaft to a horizontal position. Push back on the sensing lever, and pull forward on the top of the ribbon retainer lever of the empty ribbon spool.

(3) Pull the ribbon spool from the ribbon spool shaft and detach the inking ribbon from it. Remove the full ribbon spool from the opposite side in the same manner.

(4) Attach the new inking ribbon to the empty ribbon spool by piercing the spearhead of the ribbon spool into the inking ribbon about 1 inch from the loose end.

(5) With the spool lock in the horizontal position, the sensing lever pushed back, and the top of the ribbon retainer lever pulled forward, install the new ribbon spool on the ribbon spool shaft. Be sure that the slots in the ribbon spool engage the lugs on the ribbon feeding detent wheel and that the inking ribbon feeds from the top of the ribbon spool.

(6) Leave a long loop in the inking ribbon and install the ribbon spool on the opposite side in the same way. Turn the spool locks at the ends of the ribbon spool shaft to the vertical position. Pass the inking ribbon over the ribbon rollers in front of each ribbon spool.

(7) Give the inking ribbon a half twist, pass it under the type wheel, and slip it into the slots of the ribbon guide on either side of the type wheel. Turn one of the ribbon spools to pull the inking ribbon taut.

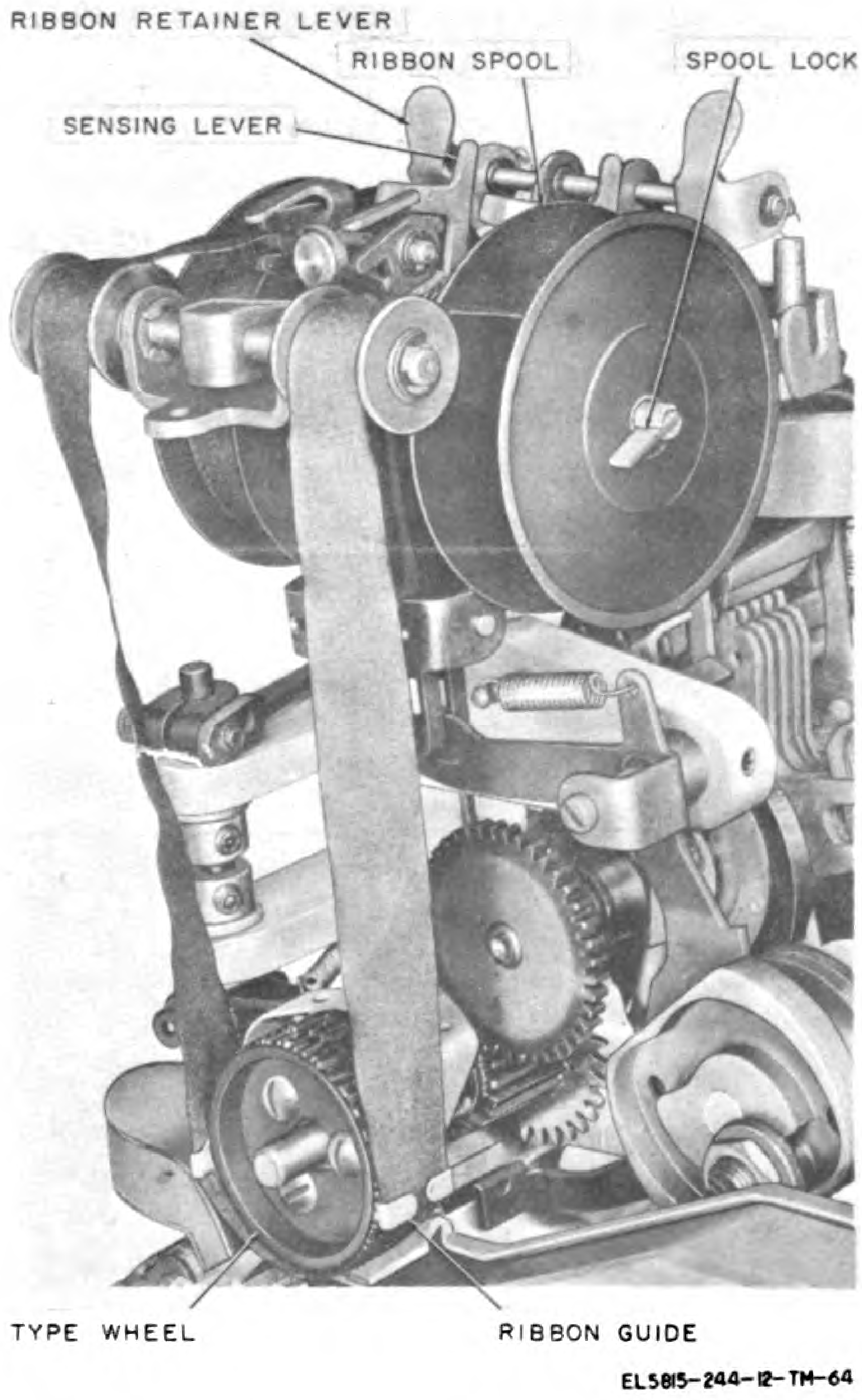


*Figure 3-16. Perforator inking ribbon mechanism.*

**NOTE**

The perforator control switches may be locked in any one of their three positions by turning the red portion of the switch arm clockwise. To release the switch, turn this portion of the switch arm counterclockwise.

### 3-4. Operational Procedure (Except AN/FGC-161 and AN/FGC-162)

Prior to using the equipment, the operator must determine which of the installation options has been selected (Condition A, B, C, etc). This is essential as the positioning of each switch singly or in combination with other switches varies with the installation option selected. The operator likewise must determine the channel designating letters which have been assigned for line 1 or line 2. Paragraph 2-20 contains charts which give the detailed switch settings for each of the typical patch panel conditions. To determine which switch settings to use, consult the chart for the installation arrangement that applies to the equipment, locate the type of operation desired, and set the switches as described in the chart. A line in the chart indicates that the position of the switch concerned does not affect the operation desired.

### 3-5. Operational Procedures (AN/FGC-161 and AN/FGC-162)

The basic operation of the teletypewriter is determined by the installation option selected. The operator controls only the sending of messages over the signal lines and the sending of simultaneous signals for local tape preparation.

### 3-6. Switch Settings for Patch Panel Conditions. (Except AN/FGC-161 and AN/FGC-162)

*a. Patch Panel Condition A.* The following chart describes the switch settings for patch panel condition A.

| Operation desired | SEND-LOCK switch | Transmitter-distributor STOP-START lever | Keyboard control switch | Perforator control switch | Line switch key | ALR MONITOR switch |
|---|---|---|---|---|---|---|
| Send to or receive from line 1 with the keyboard-transmitter, the page-printing mechanism, and the perforator receiver. | SEND | STOP | KEYBD | REPERF | LINE 1 | LINE 1. |
| Send to or receive from line 2 with the keyboard-transmitter, the page-printing mechanism, and the perforator receiver. | SEND | STOP | KEYBD | REPERF | LINE 2 | LINE 2. |
| Send to or receive from line 1 or line 2 with the transmitter-distributor, the page-printing mechanism, and the perforator receiver. | LOCK | START[a] | KEYBD | REPERF | LINE 1 or LINE 2. | LINE 1 or LINE 2. |
| PREPARE tape locally while line 1 or line 2 is held close through the automatic line return. Local page copy available. | SEND | STOP | KEYBD & TAPE. | KEYBD | TEST[b] | LINE 1 or LINE 2. |

| Operation desired | SEND-LOCK switch | Transmitter-distributor STOP-START lever | Keyboard control switch | Perforator control switch | Line switch key | ALR MONITOR switch |
|---|---|---|---|---|---|---|
| Send from the transmitter-distributor to the page-printing mechanism and the perforator receiver while the selected line is held closed through the automatic line return. No transmission to line. | SEND | START[a] | KEYBD | REPERF | TEST[b] | LINE 1 or LINE 2. |
| Prepare a local page copy. Use the keyboard-transmitter while the selected line is held close through the automatic line return. No transmission to line. | SEND | STOP | KEYBD | KEYBD | TEST[b] | LINE 1 or LINE 2. |
| Prepare tape locally while sending from the transmitter-distributor or receiving line 1 or 2 on the page-printing mechanism. | LOCK | START[a] | TAPE | KEYBD | LINE 1 or LINE 2. | LINE 1 or LINE 2. |

[a] A preliminary setting to FEED RETRACT position is required to allow for tape insertion.

[b] Follow the instructions given in paragraph 3-9 to set up the automatic line return.

*b. Patch Panel Condition B.* The following chart describes the switch settings for patch panel condition B.

| Operation desired | SEND-LOCK switch | Transmitter-distributor STOP-START lever | Keyboard control switch | Perforator control switch | Line switch key | ALR MONITOR switch |
|---|---|---|---|---|---|---|
| Send from keyboard-transmitter to page-printing mechanism and line 1. | SEND | | KEYBD | OFF. | | |
| Send from transmitter-distributor to line 2. | | START[a] | | | | |
| Prepare tape locally while sending to line 1 from the keyboard-transmitter. | SEND | | KEYBD & TAPE. | KEYBD. | | |
| Prepare tape locally. Receive line 1 on page-printing mechanism. | | | TAPE | KEYBD. | | |
| Prepare a tape copy of line 1 message. | | | KEYBD | REPERF. | | |

[a] A preliminary setting to FEED RETRACT position is required to allow for tape insertion.

*c. Patch Panel Condition C.* The following chart describes the required switch settings for patch panel condition C. A monitor copy, either page or tape, of all messages sent from the keyboard-transmitter to line 2 may be obtained by placing the receive plug of auxiliary equipment in the MONITOR 2 jack.

| Operation desired | SEND-LOCK switch | Transmitter-distributor STOP-START lever | Keyboard control switch | Perforator control switch | Line switch key | ALR MONITOR switch |
|---|---|---|---|---|---|---|
| Send to or receive from line 1 with the page-printing mechanism and the transmitter-distributor. | | START[a] | KEYBD | KEYBD. | | |
| Send from keyboard-transmitter to line 2. | SEND | | KEYBD or KEYBD & TAPE. | OFF. | | |
| Prepare tape locally without transmitting to the line. | | | TAPE | KEYBD. | | |
| Simultaneously prepare locally and transmit to line 2 from keyboard-transmitter. | SEND | | KEYBD & TAPE. | KEYBD. | | |
| Receive tape copy of line 1 message | | | KEYBD | REPERF. | | |

[a] A preliminary setting to FEED RETRACT position is required to allow for tape insertion.

*d. Patch Panel Condition D.* Messages from the line may be received by the page-printing mechanism at all times without special switch settings. The following chart describes the required switch settings. The following chart describes the required switch settings for patch panel condition D.

| Operation desired | SEND-LOCK switch | Transmitter-distributor STOP-START lever | Keyboard control switch | Perforator control switch | Line switch key | ALR MONITOR switch |
|---|---|---|---|---|---|---|
| Send from keyboard-transmitter to line 1 | SEND | | KEYBD. | | | |
| Send from transmitter-distributor to line 2. | | START [a] | | | | |
| Prepare tape locally | | | TAPE | KEYBD. | | |
| Send from keyboard-transmitter to line 1 and prepare tape locally at the same time. | SEND | | KEYBD & TAPE. | KEYBD. | | |
| Receive tape copy of line 3 message | | | KEYBD | REPERF. | | |

[a] A preliminary setting to FEED RETRACT position is required to allow for tape insertion.

*e. Patch Panel Condition E.* Messages may be received from the line at all times by the page-printing mechanism without special switch settings. The following chart describes the required switch settings for patch panel condition E.

| Operation desired | SEND-LOCK switch | Transmitter-distributor STOP-START lever | Keyboard control switch | Perforator control switch | Line switch key | ALR MONITOR switch |
|---|---|---|---|---|---|---|
| Send from transmitter-distributor to line 1. | | START [a] | KEYBD | KEYBD. | | |
| Send from keyboard-transmitter to line 2. | SEND | | KEYBD | KEYBD. | | |
| Cut tape locally without transmission to the line. | SEND | | TAPE | KEYBD. | | |
| Send from keyboard-transmitter to line 2 and cut tape locally. | SEND | | KEYBD & TAPE. | KEYBD. | | |
| Receive tape copy of line 4 message | | | KEYBD | REPERF. | | |

[a] A preliminary setting to FEED RETRACT position is required to allow for tape insertion.

*f. Patch Panel Condition F.* Messages from the line may be received by the page-printing mechanism at all times without special switch settings. The following chart describes the required switch settings for patch panel condition F.

| Operation desired | SEND-LOCK switch | Transmitter-distributor STOP-START lever | Keyboard control switch | Perforator control switch | Line switch key | ALR MONITOR switch |
|---|---|---|---|---|---|---|
| Send from keyboard-transmitter to line 1 or line 2. | SEND | STOP | KEYBD | KEYBD | LINE 1 or LINE 2. | |
| Send from transmitter-distributor to line 1 or line 2. | LOCK | START [a] | KEYBD | KEYBD | LINE 1 or LINE 2. | |
| Cut tape locally without transmitting to the line. | LOCK | STOP | TAPE | KEYBD. | | |
| Use the keyboard-transmitter to cut tape locally and send from transmitter-distributor to line 1 or line 2. | LOCK | START [a] | TAPE | KEYBD | LINE 1 or LINE 2. | |
| Cut a tape of message sent from either transmitter to the line. | SEND | START [a] | KEYBD | REPERF | LINE 1 or LINE 2. | |

[a] A preliminary setting to FEED RETRACT position is required to allow for tape insertion.

*g. Patch Panel Condition G.* The following chart describes the required switch settings for patch panel condition G.

| Operation desired | SEND-LOCK switch | Transmitter-distributor STOP-START lever | Keyboard control switch | Perforator control switch | Line switch key | ALR MONITOR switch |
|---|---|---|---|---|---|---|
| Send from keyboard-transmitter to page-printing mechanism and line 1. | SEND | STOP | KEYBD | OFF | LINE 1 | LINE 1. |
| Send from transmitter-distributor to line 2. Independent of line 1 operation. | | START [a] | | | LINE 1 or TEST. | LINE 1. |
| Prepare tape locally while receiving from line 1 on the page-printing mechanism. | LOCK | STOP | TAPE | KEYBD | LINE 1 | LINE 1. |
| Send from keyboard-transmitter to page-printing mechanism and line 1, while preparing tape locally. Send from transmitter-distributor to line 2. | SEND | START [a] | KEYBD & TAPE. | KEYBD | LINE 1 | LINE 1. |
| Prepare tape locally and monitor copy on the page-printing mechanism with the automatic line return set on line 1. No transmission to line. | SEND | | KEYBD & TAPE. | KEYBD | TEST [b] | LINE 1. |
| Receive tape copy of line 1 messages | | | KEYBD | REPERF | LINE 1 | LINE 1. |

[a] A preliminary setting to FEED RETRACT position is required to allow for tape insertion.

[b] Follow the instructions given in paragraph 3-9 to set up the automatic line return.

*h. Patch Panel Condition H.* Messages from the line may be received by the page-printing mechanism at all times without special switch settings. The following chart describes the required switch settings for patch panel condition H.

| Operation desired | SEND-LOCK switch | Transmitter-distributor STOP-START lever | Keyboard control switch | Perforator control switch | Line switch key | ALR MONITOR switch |
|---|---|---|---|---|---|---|
| Send from transmitter-distributor to line 1 | | START [a] | KEYBD | KEYBD. | | |
| Send from keyboard-transmitter to line 2. | SEND | | KEYBD | KEYBD. | | |
| Prepare tape locally | LOCK | STOP | TAPE | KEYBD. | | |
| Send from keyboard-transmitter to line 2 and prepare tape locally. | SEND | | KEYBD & TAPE. | KEYBD. | | |
| Receive tape copy of line 3 message | | | KEYBD | REPERF. | | |

[a] A preliminary setting to FEED RETRACT position is required to allow for tape insertion.

*i. Patch Panel Condition I.* The following chart describes the switch settings for patch panel condition I. Local perforation of tape is possible if an external reperforator is plugged in the MONITOR 2 jack at the rear of the perforator.

| Operation desired | SEND-LOCK switch | Transmitter-distributor STOP-START lever | Keyboard control switch | Perforator control switch | Line switch key | ALR MONITOR switch |
|---|---|---|---|---|---|---|
| Send to and receive from line 1 with the keyboard-transmitter and the page-printing mechanism. | SEND | | KEYBD | REPERF | LINE 1 | LINE 1. |
| Send to and receive from line 2 with transmitter-distributor and perforator. | | START [a] | KEYBD | REPERF | LINE 1 or TEST. | LINE 1. |
| Receive line 2 on an external reperforator. Cut tape locally, using the keyboard-transmitter and the perforator while the page-printing mechanism monitors the copy. | SEND | | KEYBD & TAPE. | KEYBD | TEST [b] | LINE 1. |
| Send to and receive from line 2 on the transmitter-distributor and an external reperforator while sending to the page-printer and line 1 from the keyboard-transmitter. Tape copy of line 1 message will be produced. | SEND | START [a] | KEYBD & TAPE. | KEYBD | LINE 1 | LINE 1. |

[a] A preliminary setting to FEED RETRACT position is required to allow for tape insertion.

[b] Follow the instructions given in paragraph 3-9 to set up the automatic line return.

*j. Patch Panel Condition J.* The following chart describes the required switch settings for patch panel condition J. Local perforation of tape is possible if an external reperforator is plugged into the MONITOR 2 jack at the rear of the perforator.

| Operation desired | SEND-LOCK switch | Transmitter-distributor STOP-START lever | Keyboard control switch | Perforator control switch | Line switch key | ALR MONITOR switch |
|---|---|---|---|---|---|---|
| Send to and receive from line 1 with the transmitter-distributor and the page-printing mechanism. | SEND | START[a] | KEYBD | REPERF | LINE 1 | LINE 1. |
| Send to and receive from line 2 with the keyboard-transmitter and the perforator. | SEND | | KEYBD | REPERF | LINE 1 or TEST. | LINE 1. |
| Send from the transmitter-distributor to the page printer to check tape prior to transmission. Automatic line return on line 1. | SEND | START[a] | KEYBD | REPERF | TEST[b] | LINE 1. |
| Local perforation of tape using an external reperforator to receive from line 2. | SEND | | TAPE | KEYBD | LINE 1 or TEST. | LINE 1. |

[a] A preliminary setting to FEED RETRACT position is required to allow for tape insertion.

[b] Follow the instructions given in paragraph 3-9 to set up the automatic line return.

*k. Patch Panel Condition K.* Messages from the line may be received by the page-printing mechanism at all times without special switch settings. The following chart describes the required switch settings for patch panel condition K.

| Operation desired | SEND-LOCK switch | Transmitter-distributor STOP-START lever | Keyboard control switch | Perforator control switch | Line switch key | ALR MONITOR switch |
|---|---|---|---|---|---|---|
| Send from keyboard-transmitter to line 1. | SEND | | KEYBD. | | | |
| Receive line 4 on perforator | | | | REPERF. | | |
| Send from transmitter-distributor to line 2. | | START[a] | | | | |

[a] A preliminary setting to FEED RETRACT position is required to allow for tape insertion.

*l. Patch Panel Condition L.* Messages from the line may be received by the page-printing mechanism at all times without special switch settings. The following chart describes the required switch settings for patch panel condition L.

| Operation desired | SEND-LOCK switch | Transmitter-distributor STOP-START lever | Keyboard control switch | Perforator control switch | Line switch key | ALR MONITOR switch |
|---|---|---|---|---|---|---|
| Send from transmitter-distributor to line 1. | | START[a] | | | | |
| Send from keyboard-transmitter to line 2 | SEND | | KEYBD. | | | |
| Receive line 3 on perforator | | | | REPERF. | | |

[a] A preliminary setting to FEED RETRACT position is required to allow for tape insertion.

*m. Patch Panel Condition M.* Messages from the line may be received by the page-printing mechanism at all times without special switch settings. The following chart describes the required switch settings for patch panel condition M.

| Operation desired | SEND-LOCK switch | Transmitter-distributor STOP-START lever | Keyboard control switch | Perforator control switch | Line switch key | ALR MONITOR switch |
|---|---|---|---|---|---|---|
| Send from transmitter-distributor to line 1 or line 2. | LOCK | START [a] | KEYBD | REPERF | LINE 1 or LINE 2. | |
| Receive line 4 on perforator | | | | REPERF | LINE 1 or LINE 2. | |
| Send from keyboard-transmitter to line 1 or line 2. | SEND | STOP | KEYBD | REPERF | LINE 1 or LINE 2. | |

[a] A preliminary setting to FEED RETRACT position is required to allow for tape insertion.

*n. Patch Panel Condition N.* The following chart describes the required switch settings for patch panel condition N.

| Operation desired | SEND-LOCK switch | Transmitter-distr. utor STOP-START lever | Keyboard control switch | Perforator control switch | Line switch key | ALR MONITOR switch |
|---|---|---|---|---|---|---|
| Send to and receive from line 1 with the keyboard-transmitter and the page-printing mechanism. | SEND | | KEYBD | REPERF. | | |
| Send from transmitter-distributor to line 2. | SEND | START [a] | KEYBD | REPERF. | | |
| Receive line 3 on perforator | | | | REPERF. | | |

[a] A preliminary setting to FEED RETRACT position is required to allow for tape insertion.

*o. Patch Panel Condition O.* Messages may be received from the line at all times by the page printer without special switch settings. The following chart describes the required switch settings for patch panel condition O.

| Operation desired | SEND-LOCK switch | Transmitter-distributor STOP-START lever | Keyboard control switch | Perforator control switch | Line switch key | ALR MONITOR switch |
|---|---|---|---|---|---|---|
| Send to and receive from line 1 with the transmitter-distributor and the perforator. | | START [a] | | REPERF. | | |
| Send from keyboard-transmitter to line 2 | SEND | | KEYBD. | | | |

[a] A preliminary setting to FEED RETRACT position is required to allow for tape insertion.

*p. Patch Panel Condition P.* The following chart describes the required switch settings for patch panel condition P.

| Operation desired | SEND-LOCK switch | Transmitter-distributor STOP-START lever | Keyboard control switch | Perforator control switch | Line switch key | ALR MONITOR switch |
|---|---|---|---|---|---|---|
| Send from keyboard to line 1 or line 2. | SEND | STOP | | | Line 1 or 2 | |
| Send from keyboard to line 1 or line 2 with home tape copy on perforator. | SEND | STOP | KEYBD & TAPE | KEYBD | Line 1 or 2 | |
| Send from transmitter-distributor to line 1 or line 2. | | | | | Line 1 or 2 | |
| Receive page copy from line 3 | | | | OFF | | |
| Receive page and tape copy from line 3 | | | | REPERF | | |
| Prepare tape locally at keyboard while sending to line 1 or 2 from transmitter-distributor. | LOCK [b] | START [a] | TAPE | KEYBD | Line 1 or 2 | |

[a] A preliminary setting to FEED RETRACT position is required to allow for tape insertion.

[b] Refers to manual lock control provided on all but Teletypewriters TT-117 FG and TT-119 FG.

### 3-7. Performance Check

Adjust the switches for the patch panel condition (or terminal box patching condition for AN/FGC-161 and AN/FGC-162) of the unit and send test messages from the keyboard-transmitter and transmitter-distributor.

*a.* End-of-line indicator lamp should light at the typing of the 66th character on a line. The margin signal bell should ring when the 66th character is printed. The carriage should return automatically after the 72d character is passed. Carriage return should take place when the carriage return code impulse is received.

*b.* Observe the action of the page printer ribbon feed mechanism while printing. The inking ribbon must be lifted and fed each time a character is typed.

*c.* Check the space bar, FIGS key, and LTRS key to see that they function properly.

*d.* With the platen in the figures (raised) position, press the LTRS button on the page printer dust cover. The platen should move to the letters position.

*e.* When the carriage is near the center of the platen, press the CAR. RET. button on the dust cover. The carriage should return to the left margin.

*f.* Check the tape printed and punched by the perforator. The message should be correctly and cleanly printed and punched.

*g.* Check the perforator ribbon feed mechanism. The ribbon should feed every other time a character is printed.

*h.* Operate the manual tape feed-out lever on the perforator when the perforator control switch is in the REPERF position. The tape should feed out when the lever is operated.

*i.* Press the back space lever. The tape should back up one space with each depression of the lever.

*j.* Insert a test tape into the transmitter-distributor.

*k.* Make the following tests while the transmitter-distributor is sending. Each of these actions should stop transmission.

(1) Raise the tight-tape lever.

(2) Move the STOP-START lever to the STOP or FEED RETRACT position.

(3) Pass the end of the message tape under the tape cover, over the tape-out lever.

### 3-8. Setting Tabulator

The tabulator mechanism is used to aline a message in columnar form quickly and easily. The tabulator is also helpful when frequent identation is required. Set and use the tabulator as follows:

*a.* Press down on the tab crank arm at the left of the tabulator, and pull down the desired tab set levers with a pencil or other suitable instrument. The red tab set levers indicate those spaces which are multiples of five.

*b.* Pull up the tabulator locking lever at the right of the tabulator stop lever. The tabulator locking lever controls the operation of the tabulator. When it is in the up position, the tabulator will operate; when it is in the down position, the tabulator will not operate.

*c.* To stop the tabulator at the predetermined spaces, press the space bar and hold down on the repeat key. When the carriage reaches the preset tab set lever, transmission from the keyboard-transmitter will stop.

*d.* Releasing the REPEAT key allows transmission to resume. Type in the desired information and press the space bar and the REPEAT key to cause the carriage to move to and stop at the next preset tab set lever.

*e.* If the tabulator stop is to be skipped, press the space bar and the REPEAT key to move the carriage to the next preset tab set lever.

### 3-9. Correcting Errors in Tape

When punching tape on the perforator for transmission at a later time, incorrect code groups that are punched into the tape can be corrected as follows:

*a.* Depress the back space lever of the tape receiver until the incorrect code group in the tape is over the punching mechanism in the code die assembly.

*b.* Depress the LTRS key. This will cancel out the incorrect code combination perforated into the tape.

*c.* Type the correct letter or symbol and then continue typing the remainder of the message.

*d.* If the error is not noticed until several characters are punched, use the LTRS key to cancel out all code groups typed after the error occurred. Starting with the incorrect code group, type in all the code groups that were canceled and continue with the message.

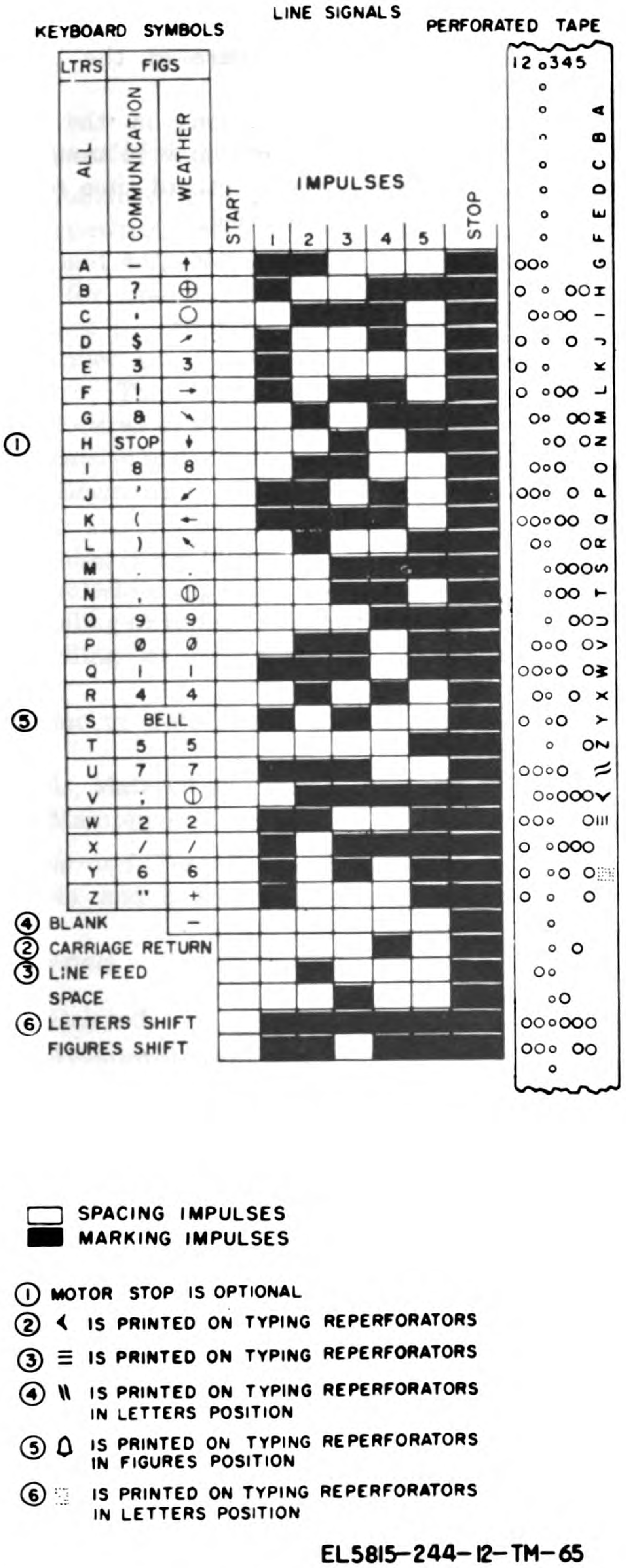

KEYBOARD SYMBOLS
LINE SIGNALS
PERFORATED TAPE
LTRS
FIGS
ALL
COMMUNICATION
WEATHER
START
IMPULSES
1 2 3 4 5
STOP
BLANK
CARRIAGE RETURN
LINE FEED
SPACE
LETTERS SHIFT
FIGURES SHIFT
SPACING IMPULSES
MARKING IMPULSES
① MOTOR STOP IS OPTIONAL
② < IS PRINTED ON TYPING REPERFORATORS
③ ≡ IS PRINTED ON TYPING REPERFORATORS
④ \\ IS PRINTED ON TYPING REPERFORATORS IN LETTERS POSITION
⑤ 🔔 IS PRINTED ON TYPING REPERFORATORS IN FIGURES POSITION
⑥ ▨ IS PRINTED ON TYPING REPERFORATORS IN LETTERS POSITION
EL5815-244-12-TM-65

*Figure 3-17. Five-unit, start-stop, code chart.*

### 3-10. Automatic Line Return (Not Applicable to AN/ FGC-161 and AN/ FGC-162)

The automatic line return feature permits Teletypewriter Set AN/FGC-25 to be used for local operation without disturbing the signal line. All the components of the set which normally are used on the signal line in conjunction with the page printer may be fully utilized for local purposes. If the distant station begins to transmit message traffic, the automatic line return will immediately return the page printer to the signal line and leave all other components in the local operational status. After the message is completed, return the page printer to local operational use by simply moving the line switch key to the line position involved and then back to the TEST position. If one of the components normally used with the page printer on the signal line is required for use on the signal line, the line switching key must be manually positioned for the desired line. The following sequence must be followed when initially setting up the automatic line return.

*a.* Place the line switch key in either LINE 1 or LINE 2, whichever line is to be monitored.

*b.* Place the ALR MONITOR switch to either LINE 1 or LINE 2, whichever line is to be monitored.

*c.* Return the line switch key to the TEST position.

### 3-11. Stopping Page Printer Motors Between Transmissions (Not Applicable to AN/ FGC-161 and AN/ FGC-162)

*a. Page Printers Equipped With Standard Communications Symbols.* All interconnected page printers equipped with the motor stop feature can be stopped and placed in a standby condition by pressing the FIGS key and then pressing the STOP key (uppercase H). When in this condition, the motors may be restarted by briefly placing the LINE-BREAK switch of any of the page printers in the BREAK position, which momentarily opens the signal circuit.

NOTE

> Operators of standard communications equipment should observe the procedure given in *b* below if any weather station equipment is in use in the signal circuit.

*b. Page Printers Equipped With Weather Symbols.* All interconnected page printers equipped with the motor stop feature can be stopped and placed in a standby condition by depressing the FIGS key, the BLANK key, and the H key in sequence. The depression of the STOP key must immediately follow the depression of the BLANK key. When in this condition, the motors may be restarted by briefly placing the LINE-BREAK switch of any of the page printers in the BREAK position, which momentarily opens the signal line.

### 3-12. Preparing Teletypewritter Set for Complete Shutdown

*a.* Place the page printer MOTOR switch in the OFF position.

*b.* Place the page printer LIGHT switch in the OFF position.

*c.* Place the perforator MOTOR switch in the OFF position.

### 3-13. Emergency Procedure

If any of the components of the set becomes disabled, the operating personnel should proceed as follows:

*a.* Notify the maintenance personnel. Describe as fully as possible the nature of the trouble encountered.

*b.* Notify the other stations in the circuit connected to the component that is in trouble and estimate, if possible, the length of time required before operation can be resumed.

# CHAPTER 4

# MAINTENANCE INSTRUCTIONS

## Section I. OPERATOR/CREW AND ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICE

### 4-1. Scope of Maintenance

The maintenance duties assigned to the operator of the teletypewriter sets are described in paragraphs 3-3, 4-5, and 4-7. No tools or test equipment are required for operator's maintenance. All other maintenance procedures described in this chapter are performed by the organizational maintenance technician. The following maintenance instructions are located in this chapter as indicated below:

*a.* Preventive maintenance (para 4-3).

*b.* Replacement of defective fuses and brushes (para 2-7).

*c.* Cleaning (para 4-7).

*d.* Troubleshooting (para 4-8).

*e.* Installing or replenishing paper (para 3-3).

*f.* Installing or changing inking ribbon (para 3-3).

*g.* Replacing defective copy lamps (para 2-7).

### 4-2. Tools, Material and Test Equipment Required for Maintenance

*a. Tools and Test Equipment.* Refer to paragraph 2-4a and b for tools and test equipment required.

*b. Materials.*

(1) Deleted.

(2) Trichlorotrifluoroethane
(NSN 6850-00-105-3084).

(3) Cleaning cloth.

(4) No. 0000 sandpaper.

(5) Oil, lubricating, general purpose, NSN 9150-00-223-4129.

### 4-3. General

NOTE

Refer to TM 750-244-2 for proper procedures for destruction of this equipment to prevent enemy use.

*a.* Operator/crew preventive maintenance is the systematic care, servicing and inspection of equipment to prevent the occurrence of trouble, to reduce downtime, and to maintain equipment in serviceable condition. To be sure that your equipment is always ready for your mission, you must do scheduled preventive maintenance checks and services (PMCS).

(1) BEFORE OPERATION, perform your B PMCS to be sure that your equipment is ready to go.

(2) When an item of equipment is reinstalled after removal, for any reason, perform the necessary B PMCS (para 4-5) to be sure the item meets the readiness reporting criteria.

(3) Use the ITEM NO. column in the PMCS table to get the number to be used in the TM ITEM NO. column on DA Form 2404 (Equipment Inspection and Maintenance Worksheet) when you fill out the form.

*b.* Organizational preventive maintenance procedures are designed to help maintain equipment in serviceable condition. They include items to be checked and how to check them. These checks and services, described in paragraph 4-6, outline inspections that are to be made at specific quarterly (Q) intervals.

*c.* Routine checks like CLEANING, PRESERVATION, DUSTING, WASHING, CHECKING FOR FRAYED CABLES, STOWING ITEMS NOT IN USE, COVERING UNUSED RECEPTACLES, CHECKING FOR LOOSE NUTS AND BOLTS, AND COMPLETENESS are not listed as PMCS checks. They are things that you should do any time you see they must be done. If you find a routine check like one of those listed in your PMCS, it is because other operators reported problems with this item.

NOTE

When you are doing any PMCS or routine checks, keep in mind the warnings and cautions.

WARNINGS

- Adequate ventilation should be provided while using TRICHLOROTRIFLUOROETHANE. Prolonged breathing of vapor should be avoided. The solvent should not be used near heat or open flame; the products of decomposition are toxic and irritating. Since TRICHLOROTRIFLUOROETHANE dissolves natural oils, prolonged contact with skin should be avoided. When necessary, use gloves which the solvent cannot penetrate. If the solvent is taken internally, consult a physician immediately.

- Compressed air is dangerous and can cause bodily harm if protective means or methods are not observed to prevent a chip or particle (of whatever size) from being blown into the eyes or unbroken skin of the operator or other personnel. Goggles must be worn at all times while cleaning with compressed air. Compressed air shall not be used for cleaning purposes except where reduced to less than 29 pounds per square inch gage (psig) and then only with effective chip guarding and personnel protective equipment. Do not use compressed air to dry parts when trichlorotrifluoroethane has been used.

NOTES

The PROCEDURES column in your PMCS charts instruct how to perform the required checks and services. Carefully follow these instructions and, if tools are needed or the chart so instructs, get organizational maintenance to do the necessary work.

If your equipment must be in operation all the time, check those items that can be checked and serviced without disturbing operation. Make the complete checks and services when the equipment can be shut down.

*d.* Deficiencies that cannot be corrected must be reported to higher category maintenance personnel. Records and reports of preventive maintenance must be made in accordance with procedures given in TM 38-740.

### 4-4. Operator/Crew Preventive Maintenance Checks and Services

Perform before operation PMCS if you are operating the item for the first time.

NOTE

The checks in the interval column are to be performed in the order listed.

### 4-5. Operator/Crew Preventive Maintenance Checks and Services Chart

B — Before

| Item No. | Interval | Item to be inspected | Procedures — Check for and have repaired or adjusted as necessary | Equipment is not Ready/Available If: |
|---|---|---|---|---|
| | B | | | |
| 1 | • | Mission Essential Equipment | Check for completeness and satisfactory condition of the equipment. Report missing items. | Available equipment is insufficient to support the combat mission. |
| 2 | * | Teletypewriter Set | Perform operational checks as described in paragraph 3-5 to 3-7 and 3-10. | Teletypewriter does not operate (Prints or sends garbled signals) |

*Do this check before each deployment to a mission location. This will permit any existing problems to be corrected before the mission starts. The check does not need to be done again until redeployment.

### 4-6. Organizational Preventive Maintenance Checks and Services Chart

Q — Quarterly

| Item No. | Interval | Item to be inspected | Procedures |
|---|---|---|---|
| | Q | | |
| 1 | • | Motor brushes | Inspect motor brushes. Replace if required. See paragraph 2-8. |
| 2 | • | Teletypewriter Sets | Perform all lubrication procedures as described in paragraph 2-14. |

### 4-7. Cleaning

Inspect the exterior surfaces of the teletypewriter set. The exterior surfaces should be clean, free of dust, dirt, grease, and fungus.

*a.* Clean the outer surfaces, removing dust and loose dirt with a clean, dry, lint-free cloth.

CAUTION

Do not use steel wool. Minute particles of steel can enter the electrical components and cause harmful internal shorting and grounding of circuit.

*b.* Use No. 0000 sandpaper to remove corrosion.

WARNING

Adequate ventilation should be provided while using TRICHLOROTRIFLUOROETHANE. Prolonged breathing of vapor should be avoided. The solvent should not be used near heat or open flame; the products of decompositions are toxic and irritating. Since TRICHLOROTRIFLUOROETHANE dissolves natural oils, prolonged contact with skin should be avoided. When necessary, use gloves which the solvent cannot penetrate. If the solvent is taken internally, consult a physician immediately.

*c.* To remove deposites of oil, grease, or ground-in dirt from the exterior surfaces, use a cloth dampened (not wet) with trichlorotrifluoroethane. Remove the deposit and wipe the exterior surfaces with a dry cloth.

*d.* Remove dust and dirt from plugs and jacks with a brush.

*e.* Clean panels and control knobs with a soft, clean cloth. If dirt is difficult to remove, dampen the cloth with water; use a mild soap if necessary.

WARNING

Compressed air is dangerous and can cause serious bodily harm if protective means or methods are not observed to prevent a chip or particle (of whatever size) from being blown into the eyes or unbroken skin of the operator or other personnel. Goggles must be worn at all times while cleaning with compressed air. Compressed air shall not be used for cleaning purposes except where reduced to less than 29 pounds per square inch gage (psig) and then only with effective chip guarding and personnel protective equipment. Do not use compressed air to dry parts when trichlorotrifluoroethane has been used.

### 4-8. Troubleshooting

*a. General.* The troubleshooting procedures listed are based on the operational portion of the operator's preventive maintenance checks and services chart and will help organizational maintenance personnel correct a malfunction. Only those corrective measures which are within the scope of organizational maintenance are presented here. If the measures suggested do not restore the equipment to normal operation, refer to higher maintenance personnel for corrective action.
for corrective action.

*b. Procedure.* With the set in operation (para 3-4), note the apparent malfunction. Locate the malfunction in the chart (c below). Note the probable cause and take the indicated corrective action for each probable cause. If the indicated corrective action does not restore the equipment to an operable condition, report the deficiency in accordance with TM 38-750.

*c. Troubleshooting Chart.*

| Item No. | Malfunction | Probable cause | Corrective action |
|---|---|---|---|
| 1 | Motor fails to start | Ac power fuse blown. Failure of power source. | Replace fuse (para 2-8). Correct defect or use another power source. |
| 2 | Copy lamp does not light | Defective copy lamp | Replace lamp (para 2-8). |
| 3 | No power | Power cord not plugged in | Connect power cord (para 2-9). |
| 4 | Ground | Ground lead disconnected | Connect ground lead (para 2-9). |
| 5 | Page printer motor fails to start | Page printer motor plug not correctly inserted in its receptacle. | Insert plug properly. |
| 6 | Reperforator motor fails to start | Reperforator motor plug not correctly inserted in its receptacle. | Insert plug properly. |
| 7 | Loss of all functions in set | Fuses blown | Check fuses (para 2-8). |
| 8 | Direction of ribbon does reverse | Eyelet missing from one end of ribbon. | Replace ribbon (para 3-3). |
| 9 | Tape does not feed through transmitter-distributor. | Feed hole portion of tape defective. | Obtain and use good tape. |
| 10 | Motor runs but speed is erratic. | Worn brushes | Replace brushes (para 2-8). |

## Section II. CONVERSION TO SYNCHRONOUS MOTOR OPERATION

### 4-9. Synchronous Motor Operation

Convert Teletypewriter Set AN/FGC-25X to synchronous motor operation, when required, by changing the motors and motor filter box assemblies as follows:

*a. Parts Required.* Modification kit (FSN 6105-831-6248) is required to convert the AN/FGC-25X to synchronous motor operation. Do not requisition the kit until authorization has been received. The kit consists of the following items:

| *Item No.* | *Description* |
|---|---|
| 1-1 | 1 motor assembly, synchronous: 115 v; 60 cycle; 1/20 hp; 3,600 rpm; Kleinschmidt part No. 59202A or equal. |
| 1-2 | 10 shims: 7/16 in. w by 1¾ in. o/a lg; 0.002 thk. Kleinschmidt part No. 51509 or equal. FSN 5815-527-0231. |
| 1-3 | 10 shims: 7/16 in. w by 1¾ in. o/a lg; 0.005 thk. Kleinschmidt part No. 51510 or equal. FSN 5815-527-0230. |
| 1-4 | 8 lockwashers: split helical ring; No. 6 in. nom bolt size. Kleinschmidt part No. 10429 or equal. FSN 5310-209-5118. |
| 1-5 | 7 screws, machine: No. 6-40 x 3/8 in. lg; flat fillister head; socket drive. Kleinschmidt part No. 10004 or equal. FSN 5305-521-8644. |
| 1-6 | 1 screw, machine: No. 6-40 x ½ in. lg; flat fillister head; socket drive. Kleinschmidt part No. 10005 or equal. FSN 5305-521-8648. |
| 1-7 | 4 lockwashers: ext and int teeth, No. 10 in. nom bolt size. Kleinschmidt part No. 10406 or equal. FSN 5310-261-6197. |
| 1-8 | 1 filter box assembly: synchronous motor: Kleinschmidt part No. 59805A or equal. |
| 1-9 | 8 lockwashers: int. teeth, No. 8 in. nom bolt size. Kleinschmidt part No. 10404 or equal. FSN 5310-261-6198. |
| 1-10 | 4 lockwashers: int teeth, No. 6 in. nom bolt size. Kleinschmidt part No. 10403 or equal. FSN 5310-209-3990. |
| 1-11 | 4 screws, machine: No. 6-32 x 3/8 in. lg; binding head; slot drive. Kleinschmidt part No. 10308 or equal. FSN 5305-206-2267. |
| 1-12 | 1 motor assembly, synchronous: 115 v; 60 cycle, 1/20 hp; 3,600 rpm; Kleinschmidt part No. 61333A or equal. |
| 1-13 | 1 knob: ½ in. lg. o/a; 1¼ in. dia; 13/32 in. thk. Kleinschmidt part No. 54217 or equal. FSN 5355-579-7023. |
| 1-14 | 1 setscrew: 10-32 x 3/8 in. lg; cup point; socket drive. Kleinschmidt part No. 10211 or equal. FSN 5305-333-4254. |
| 1-15 | 4 lockwashers: ext and int teeth, No. 8 in. nom bolt size. Kleinschmidt part No. 10436 or equal. FSN 5310-261-6192. |
| 1-16 | 1 filter box assembly, synchronous motor. Kleinschmidt part No. 59897 or equal. |
| 1-17 | 4 screws, machine: No. 8-32 x 3/16 in. lg; binding head; slot drive. Kleinschmidt part No. 10376 or equal. FSN 5305-281-1060. |

*b. Teletypewriter TT-119A/FG.*

NOTE

Item numbers in parentheses are listed in *a* above.

(1) Remove the teletypewriter power cable from the 115-volt ac convenience outlet at the back of the reperforator-transmitter.

(2) Disconnect the keyboard cable from the reperforator-transmitter cable underneath the table.

(3) Remove the dust cover from the teletypewriter.

(4) Lift the left side of the teletypewriter and disconnect the motor plug connector from its receptacle connector in the teletypewriter base.

(5) Remove the four machine screws and lockwashers that hold the gear to the teletypewriter frame (fig. 4-1).

(6) Remove the gear cover, gasket, and worm gear bracket (fig. 4-1).

(7) Remove the four machine screws and lockwashers that hold the series-governed motor assembly to the teletypewriter frame (fig. 4-1). Remove the motor assembly by moving it sideways from the teletypewriter frame. Discard any shims.

(8) Remove the machine screw and lockwasher that hold the worm gear on the motor shaft. Remove the worm gear (fig. 4-1).

(9) Install the worm gear on the synchronous motor assembly shaft (item 1-1) as shown in figure 4-2. Secure the worm gear with the lockwasher and machine screw (8) above).

(10) Install the synchronous motor assembly (item 1-1) on the teletypewriter frame and secure it with the four lockwashers and machine screws ((7) above) as shown in figure 4-2. Do not tighten the machine screws.

(11) Visually center the worm gear with the main shaft driving gear.

(12) Position the motor to obtain minimum backlash without binding between the worm gear and the main shaft driving gear (fig. 4-3).

(13) If necessary, install shims (items 1-2 and 1-3) between the motor and the teletypewriter frame to obtain the correct clearance between the gears (fig. 4-3).

(14) Tighten the four machine screws when the correct adjustment is obtained.

(15) Reinstall the gasket, gear cover, and worm gear bracket on the teletypewriter frame and secure them with four lockwashers (item 1-4), three machine screws (item 1-5), and one machine screw (item 1-6). The longer machine screw (item 1-6) also secures the motor stop switch cable clamp on the worm gear bracket (fig. 4-2).

(16) Gently place the teletypewriter on its motor side to provide access to the unit base plate.

(17) Remove the nine machine screws that hold the base plate to the teletypewriter base. Remove the base plate.

(18) Remove the four machine screws and lockwashers that hold the cover on the motor filter box assembly (fig. 4-4). Remove the cover.

(19) Disconnect all the leads of the two cables that enter the motor filter box assembly and terminate at board TB1.

### CAUTION

To facilitate reinstallation, record the color code of each lead and its respective terminal number before disconnection.

(20) Remove the four studs and lockwashers that hold the motor filter box assembly to the teletypewriter base (fig. 4-4).

(21) Remove the motor filter box assembly and the four grounding lockwashers from the teletypewriter base (fig. 4-4).

(22) Install four lockwashers (item 1-7) and synchronous motor filter box assembly (item 1-8) on the teletypewriter base. Secure them with four lockwashers (item 1-9) and the four studs ((20) above) (fig. 4-5).

(23) Reconnect the leads of the two cables to their respective terminals on terminal board TB1 of the motor filter box assembly (fig. 4-5). Follow the color code and terminal numbers recorded during removal.

(24) Reinstall the cover on the motor filter box assembly and secure it with four lockwashers (item 1-10) and four machine screws (item 1-11) as shown in figure 4-5. Reinstall the cable grommet in its normal position on the filter box cover.

(25) Reinstall the base plate on the teletypewriter base and secure it with the original hardware.

(26) Reconnect the motor plug connector to the receptacle connector in the synchronous motor filter box assembly.

(27) Return the teletypewriter to its normal upright position.

(28) Reinstall the dust cover on the teletypewriter.

(29) Return the series-governed motor and filter box assemblies to depot stock.

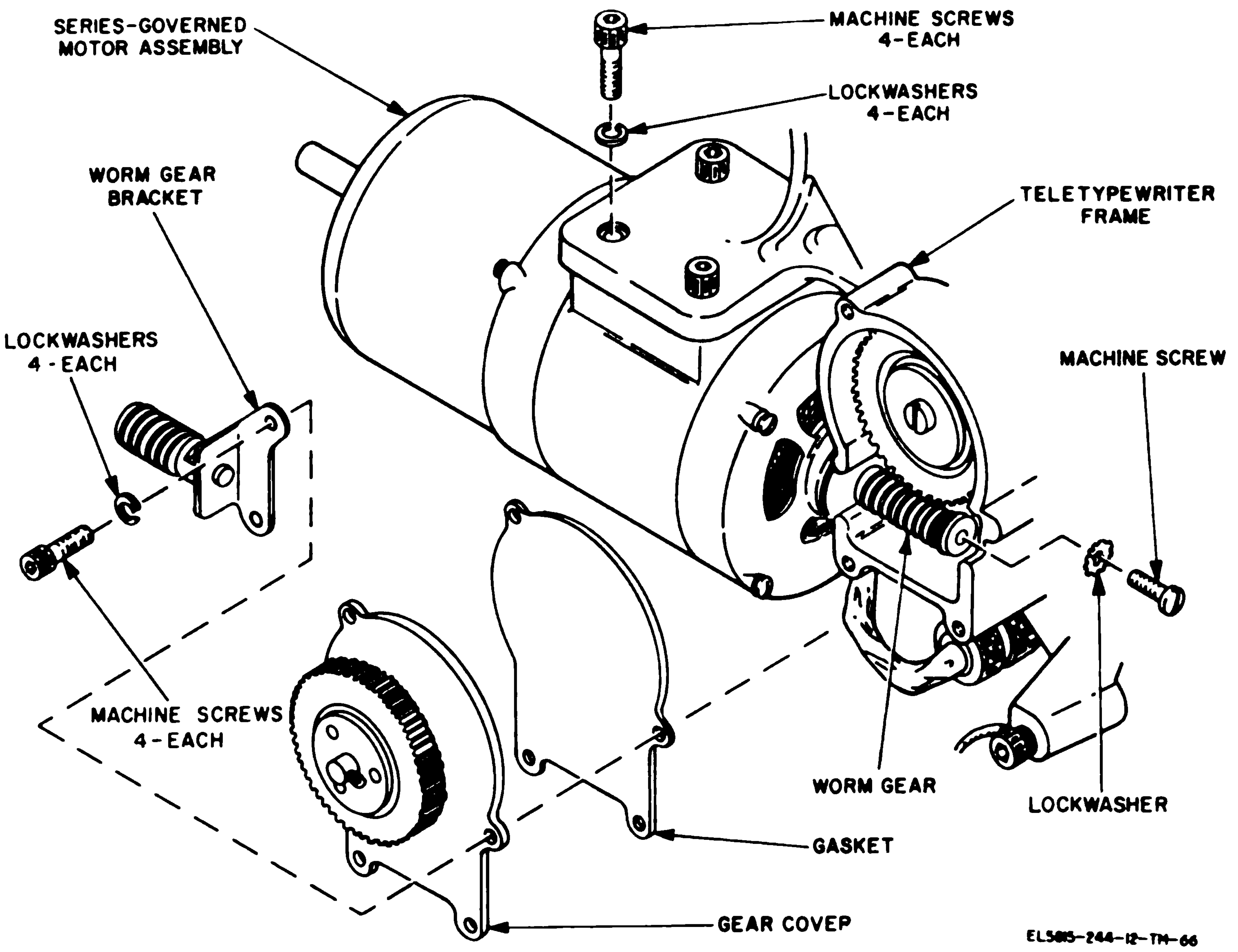


*Figure 4-1. Series-governed motor assembly removal (teletypewriter ).*

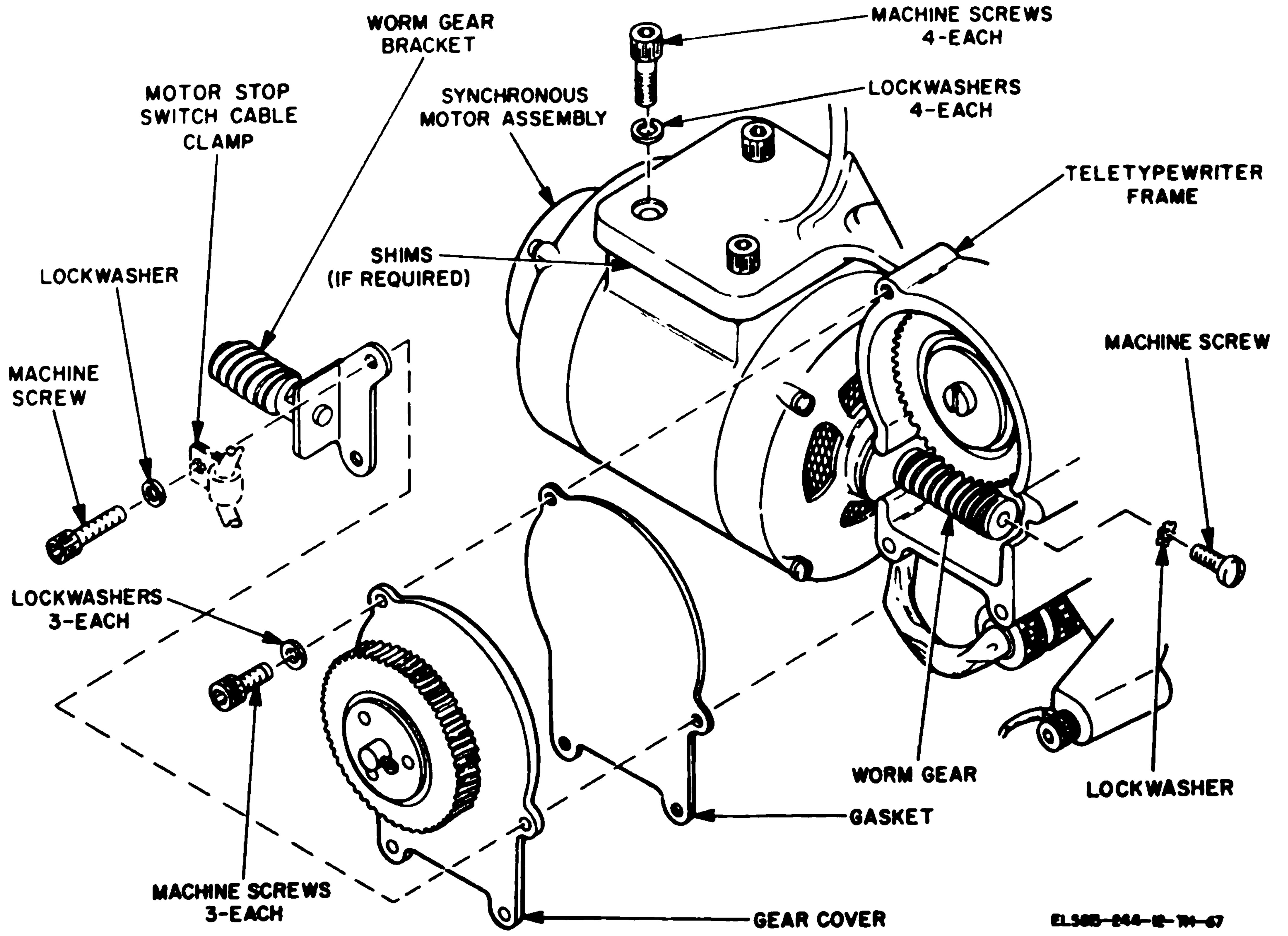


*Figure 4-2. Installation of synchronous motor assembly (teletypewriter ).*

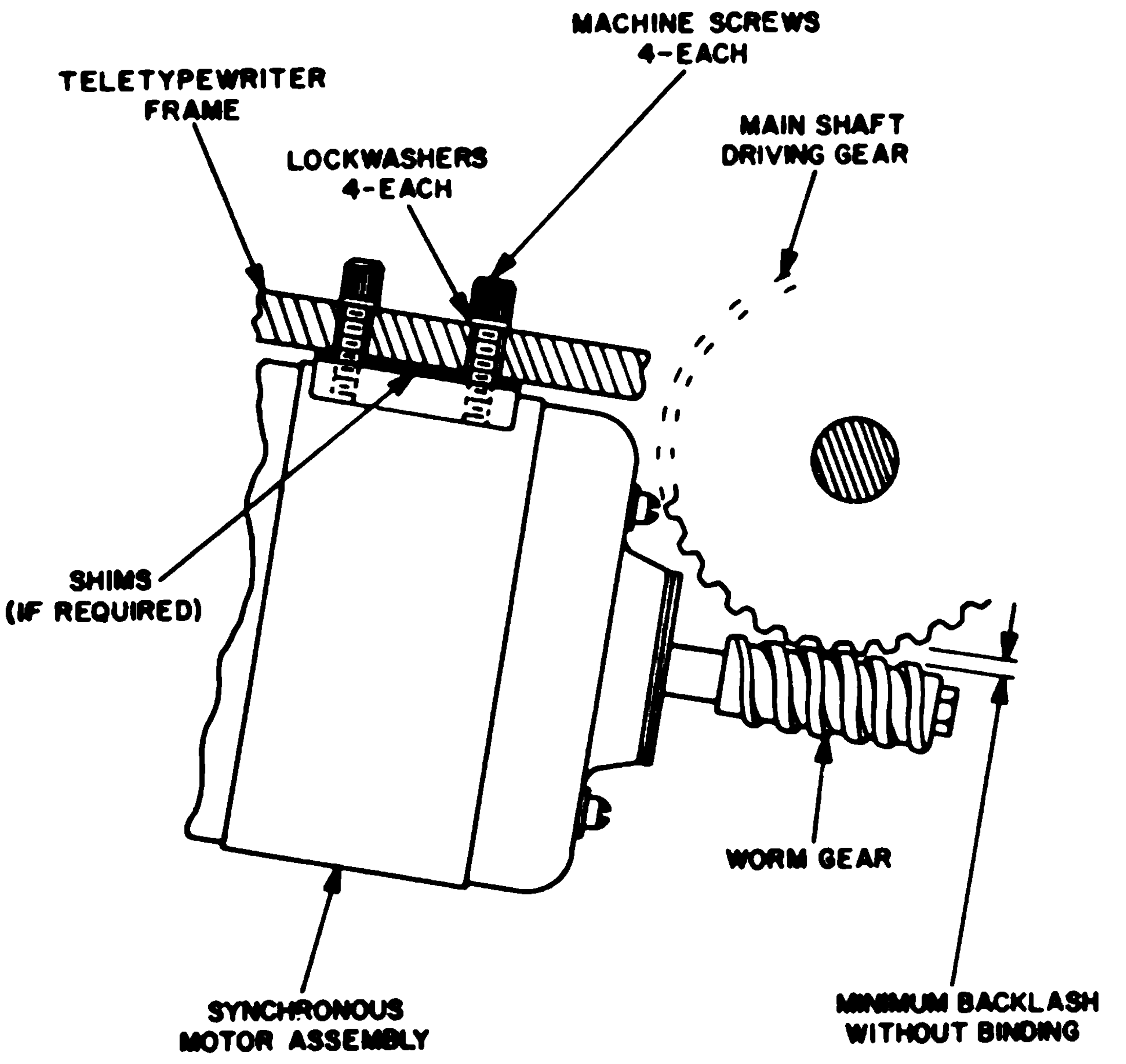


*Figure 4-3. Synchronous motor assembly alignment (teletypewriter).*

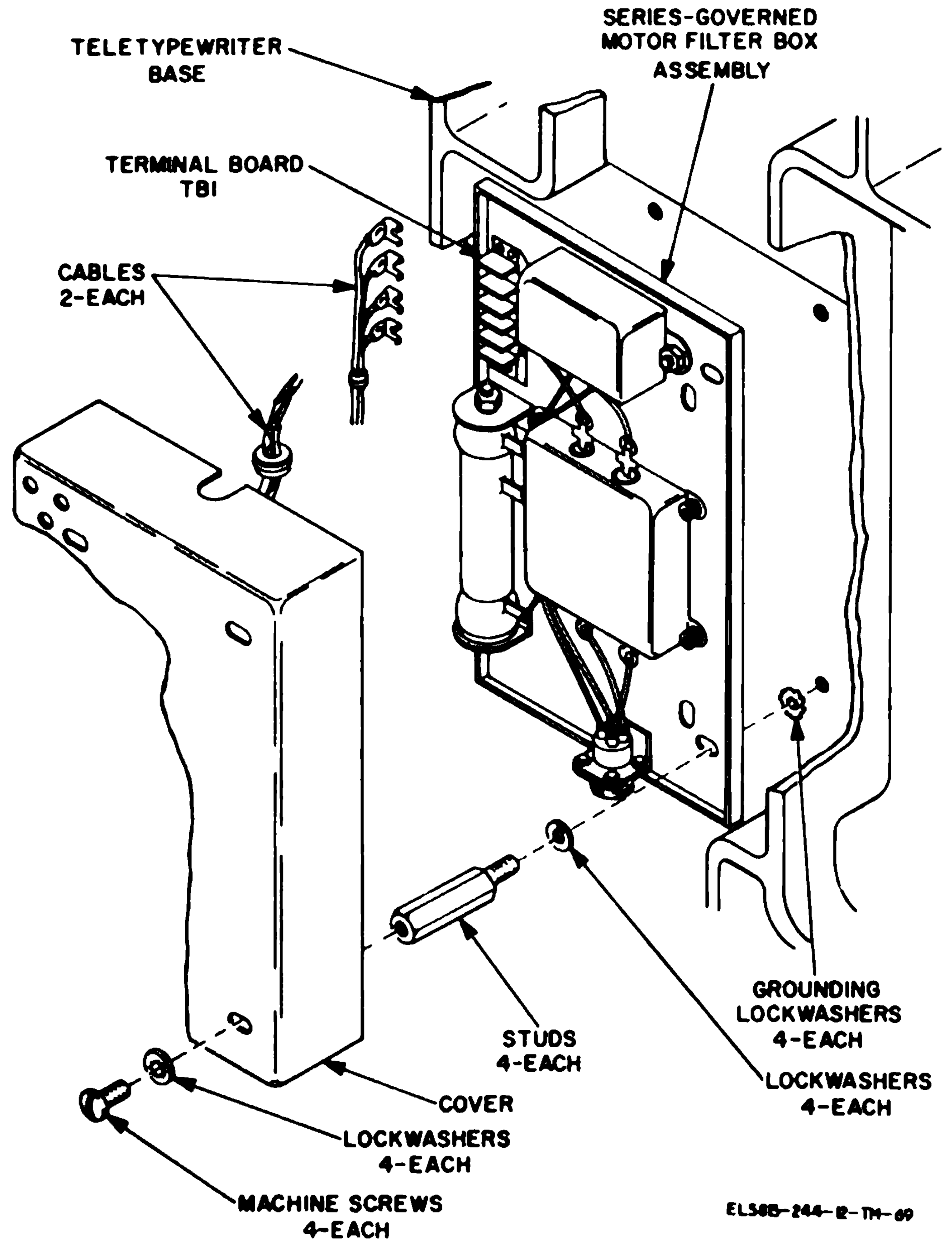


*Figure 4-4. Series-governed motor filter box assembly removal (teletypewriter).*

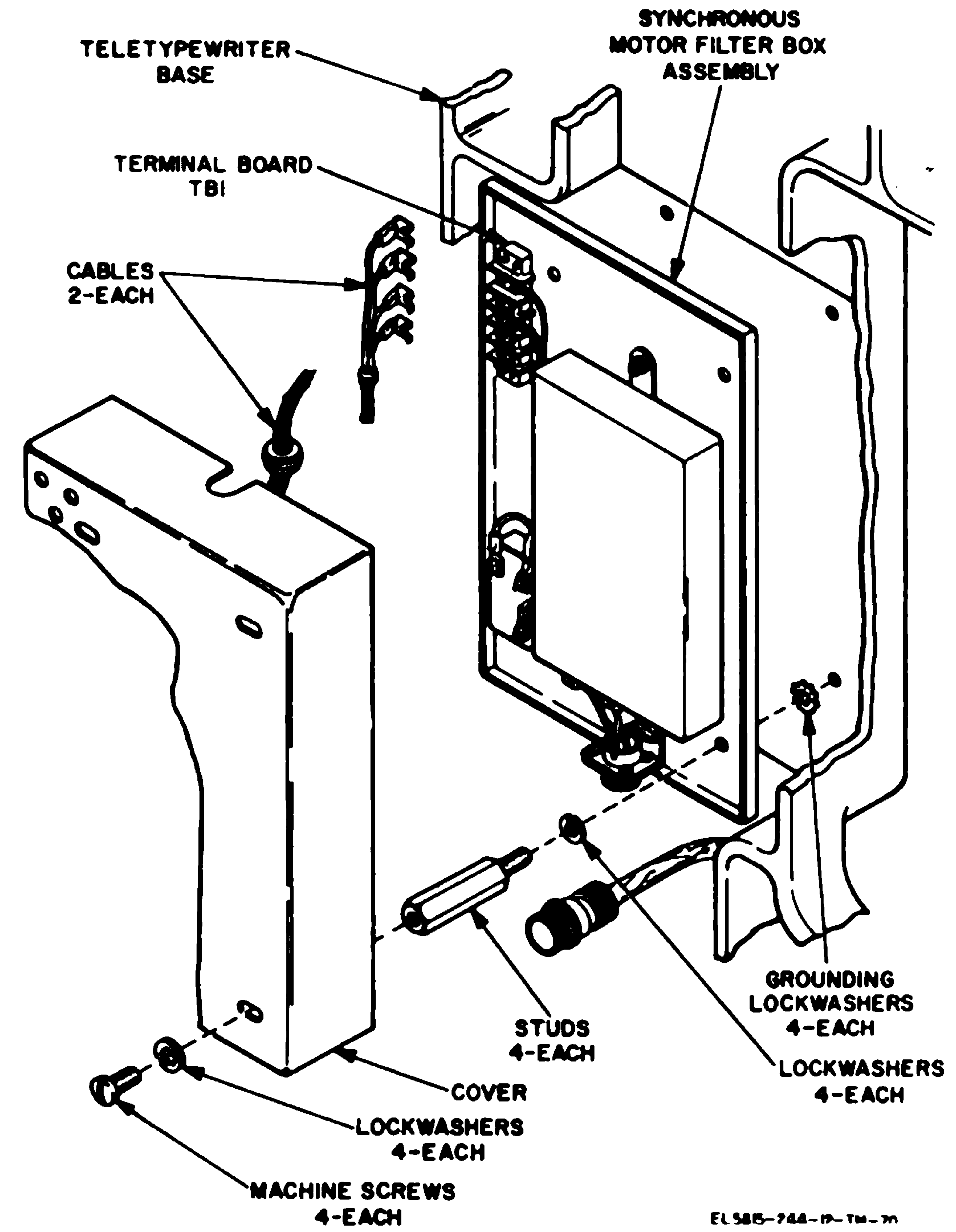


*Figure 4-5. Synchronous motor filter box assembly installation (teletypewriter).*

c. *Reperforator-Transmitter TT-178A/FG.*

(1) Disconnect the teletypewriter signal line plugs from the reperforator-transmitter rear control panel.

(2) Remove the dust cover from the reperforator-transmitter.

(3) Disconnect the motor plug connector from its receptacle connector in the repertorator-transmitter base.

(4) Remove the four machine screws and lockwashers that hold the gearcase cover and gasket to the gearcase. Remove the gearcase cover and gasket (fig. 4-6).

(5) Remove the four machine screws and lockwashers that hold the series-governed motor assembly to the reperforator-transmitter frame (fig. 4-6).

(6) Move the drive end of the armature shaft out of the gearcase far enough so that the worm gear clears the gearcase. Remove the motor

assembly from the reperforator-transmitter frame (fig. 4-6). Discard any shims.

(7) Remove the machine screw and lockwasher that hold the worm gear on the motor shaft. Remove the worm gear (fig. 4-6).

(8) Install the worm gear on the synchronous motor assembly shaft (item 1-12) (fig. 4-7). Secure the worm gear with the lockwasher and machine screw ((7) above).

(9) Install knob (item 1-13) on the synchronous motor shaft and secure it with the setscrew (item 1-14) (fig. 4-7). Align the setscrew with the flat of the shaft.

(10) Install the synchronous motor assembly (item 1-12) on the reperforator-transmitter frame and secure it with the four lockwashes and machine screws ((5) above) (fig. 4-7). Do not tighten the machine screws too tight, since they must be adjusted later.

(11) Visually center the worm gear with the gear assembly on the reperforator-transmitter main shaft driving gear (fig. 4-8).

(12) If necessary, install shims (items 1-2 and 1-3) between the motor and the reperforator-transmitter frame to obtain the proper alignment (fig. 4-8).

(13) Position the motor to obtain minimum backlash without binding between the worm gear and main shaft driving gear (fig. 4-8).

(14) Tighten the four machine screws when the correct adjustment is obatined.

(15) Reinstall the gasket and gearcase cover on the reperforator-transmitter frame and secure them with four lockwashers (item 1-4) and four machine screws (item 1-5) (fig. 4-7).

(16) Pull enough of the reperforator-transmitter cable through the opening in the table to permit the reperforator-transmiter to lie on its side.

(17) Gently place the reperforator-transmitter on its motor side to permit access to the base plate.

(18) Remove the seven machine screws that hold the baseplate on the reperforator-transmitter base. Remove the base plate.

(19) Remove the three machine screws and lockwashers that hold the cover on the motor filter box assembly (fig. 4-9). Remove the discard the cover.

(20) Disconnect all the cable leads that enter the motor filter box assembly and terminate at terminal board TB204 (fig. 4-9).

CAUTION

Record the color code of each lead and its respective terminal number before disconnection to facilitate reinstallation.

(21) Remove the three studs, lockwashers, two machine screws, and the lockwashers that hold the motor filter box assembly to the reperforator-transmitter base (fig. 4-9). Discard the studs.

(22) Remove the motor filter box assembly and the five grounding lockwashers from the reperforator-transmitter base (fig. 4-9).

(23) Install four lockwashers (item 1-15) and synchronous motor filter box assembly (item 1-16) on the reperforator-transmitter base (fig. 4-10). Secure them with four lockwashers (item 1-9) and four machine screws (item 1-17).

NOTE

Stiff wires or thin rods may be used in the mounting holes as temporary guides when installing the lockwashers and motor filter box assembly.

(24) Reconnect the leads of the cable to their respective terminals on terminal board TB204 of the motor filter box assembly (fig. 4-10). Follow the color code and terminal numbers recorded during removal.

(25) Reinstall the base plate on the reperforator-transmitter and secure it with the original hardware.

(26) Return the reperforator-transmitter to its normal upright position.

(27) Reconnect the motor plug connector to its receptacle connector in the reperforator-transmitter base.

(28) Reconnect the reperforator-transmitter cable to the keyboard cable underneath the table.

(29) Reinstall the dust cover on the reperforator-transmitter.

(30) Insert the teletypewriter signal line plugs in their respective jacks on the reperforator-transmitter rear control panel.

(31) Insert the teletypewriter power cable assembly in the 115-volt ac convenience outlet at the back of the reperforator-transmitter.

(32) Perform the operational checks and adjustments.

(33) Return the series-governed motor and filter box assemblies to depot stock.

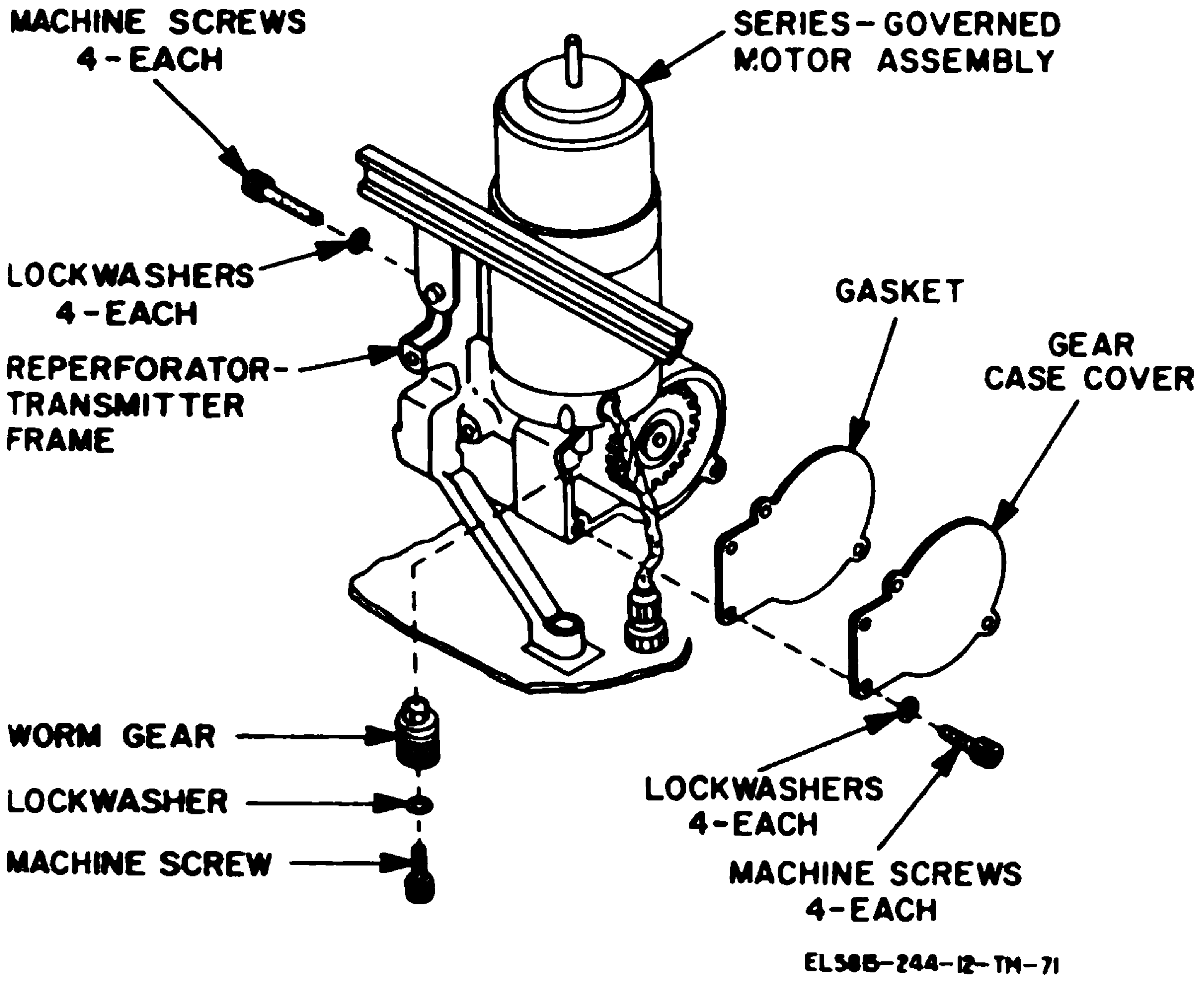


*Figure 4-6. Series-governed motor assembly removal (reperforator-transmitter).*

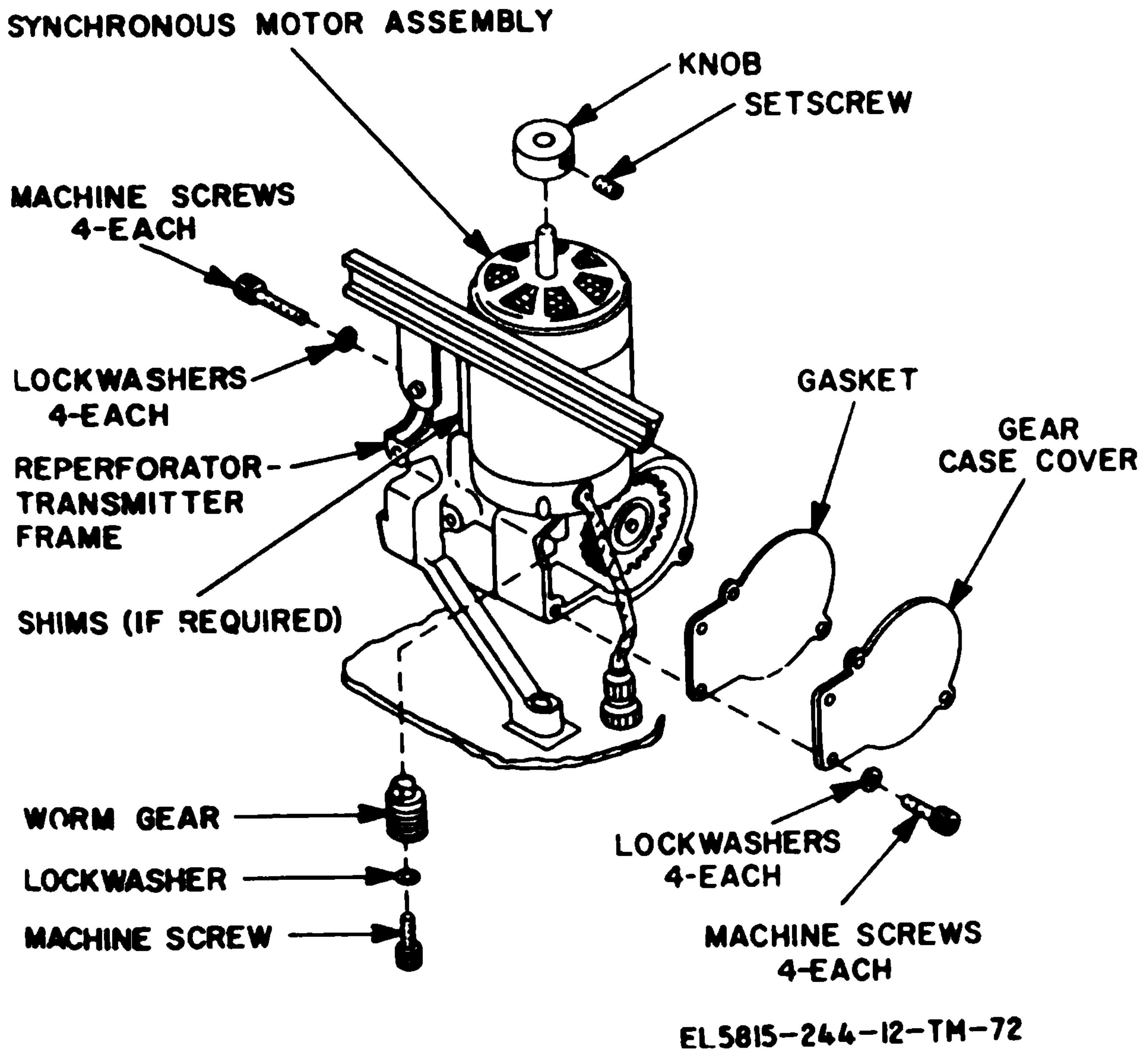


*Figure 4-7. Synchronous motor assembly installation (reperforator-transmitter).*

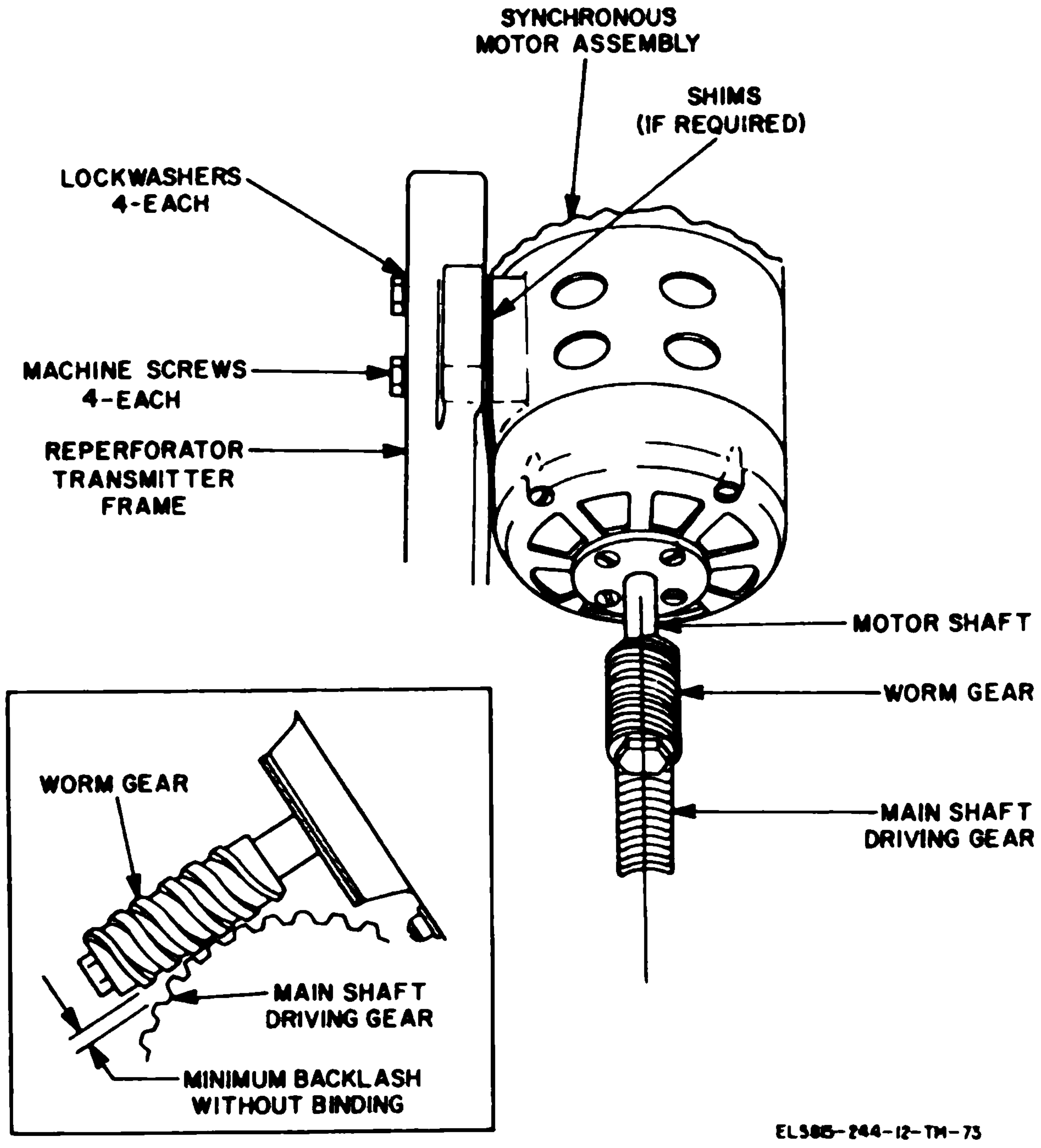


*Figure 4-8. Synchronous motor assembly alignment (reperforator-transmitter).*

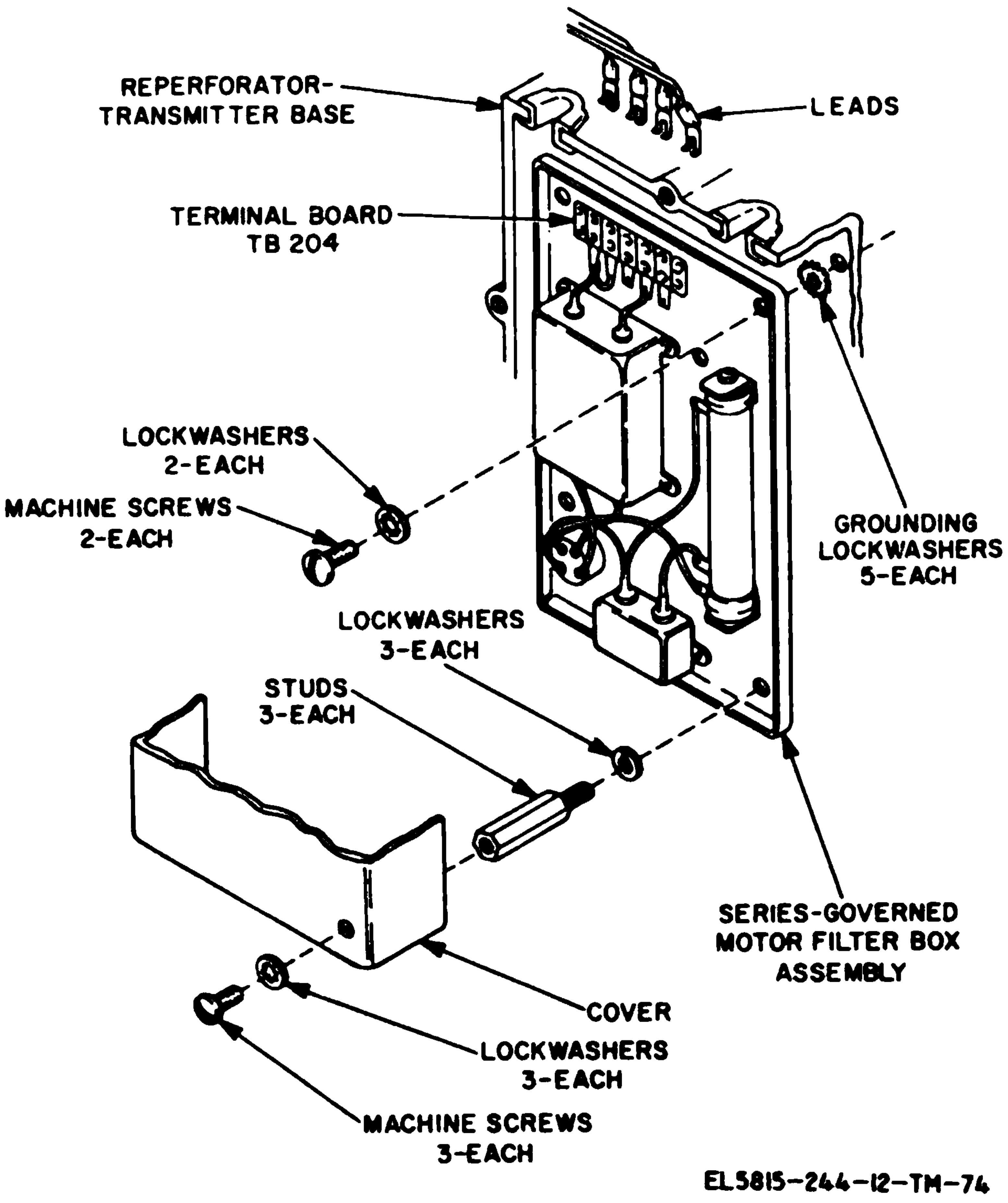
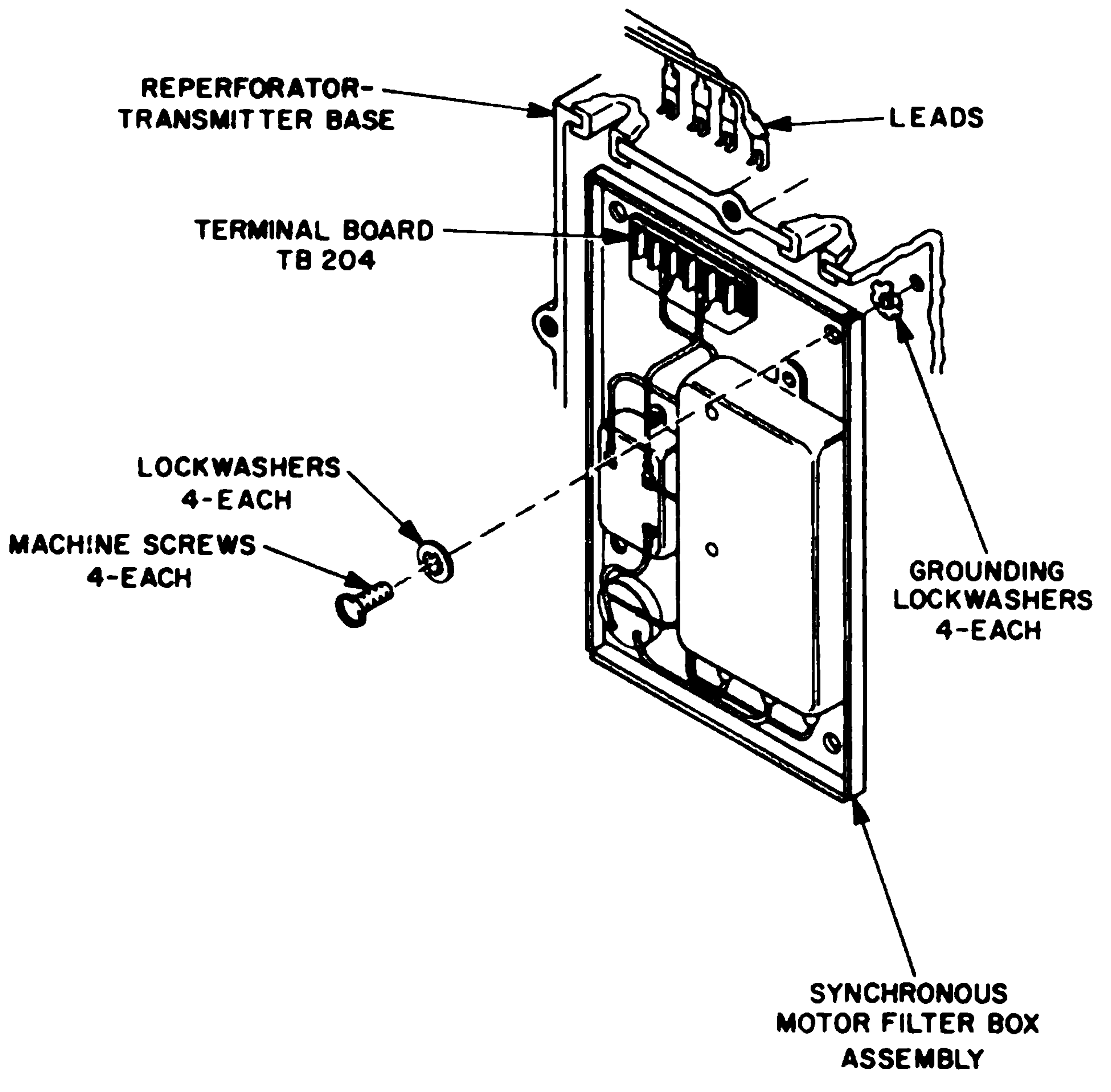


*Figure 4-9. Series-governed motor filter box assembly removal (reperforator-transmitter).*


REPERFORATOR-TRANSMITTER BASE
LEADS
TERMINAL BOARD TB 204
LOCKWASHERS 4-EACH
MACHINE SCREWS 4-EACH
GROUNDING LOCKWASHERS 4-EACH
SYNCHRONOUS MOTOR FILTER BOX ASSEMBLY

EL5815-244-12-TM-75

*Figure 4-10. Synchronous motor filter box assembly installation (reperforator-transmitter ).*

### 4-10. External Control of Clutch Magnets

To permit external control of the clutch magnet of the transmitter-distributors when used in conjunction with COMSEC equipment, rewire the transmitter-distributor terminal board as follows:

*a. Removal of Front Plate and Outside Cover of Transmitter-Distributors (All Models ).*

(1) Remove the two screws, lockwashers, and bushings which hold the front plate to the transmitter-distributor frame; remove the front plate.

(2) Ease the outside cover to the left side, and release the studs on the cover from the retaining holes at the rear of the transmitter-distributor; remove the outside cover.

*b. Reperforator-Transmitters TT-178/FG and TT-179/FG.*

(1) Locate the BRN-BLK lead connected between terminal 4 on terminal board TB5 and the normally open contact terminal on start-stop switch S17 (A, fig. 4-11).

(2) Remove the end of the BRN-BLK lead connected to terminal 4 on the terminal board and connect it to the rear of terminal 7 of the terminal board (B, fig. 4-11).

(3) Locate the GRN-RED lead connected between terminal 5 of terminal board TB5 and clutch magnet E7 (A, fig. 4-11).

(4) Remove the end of the GRN-RED lead from terminal 5 and connect it to the rear of terminal 8 on the terminal board (B, fig. 4-11).

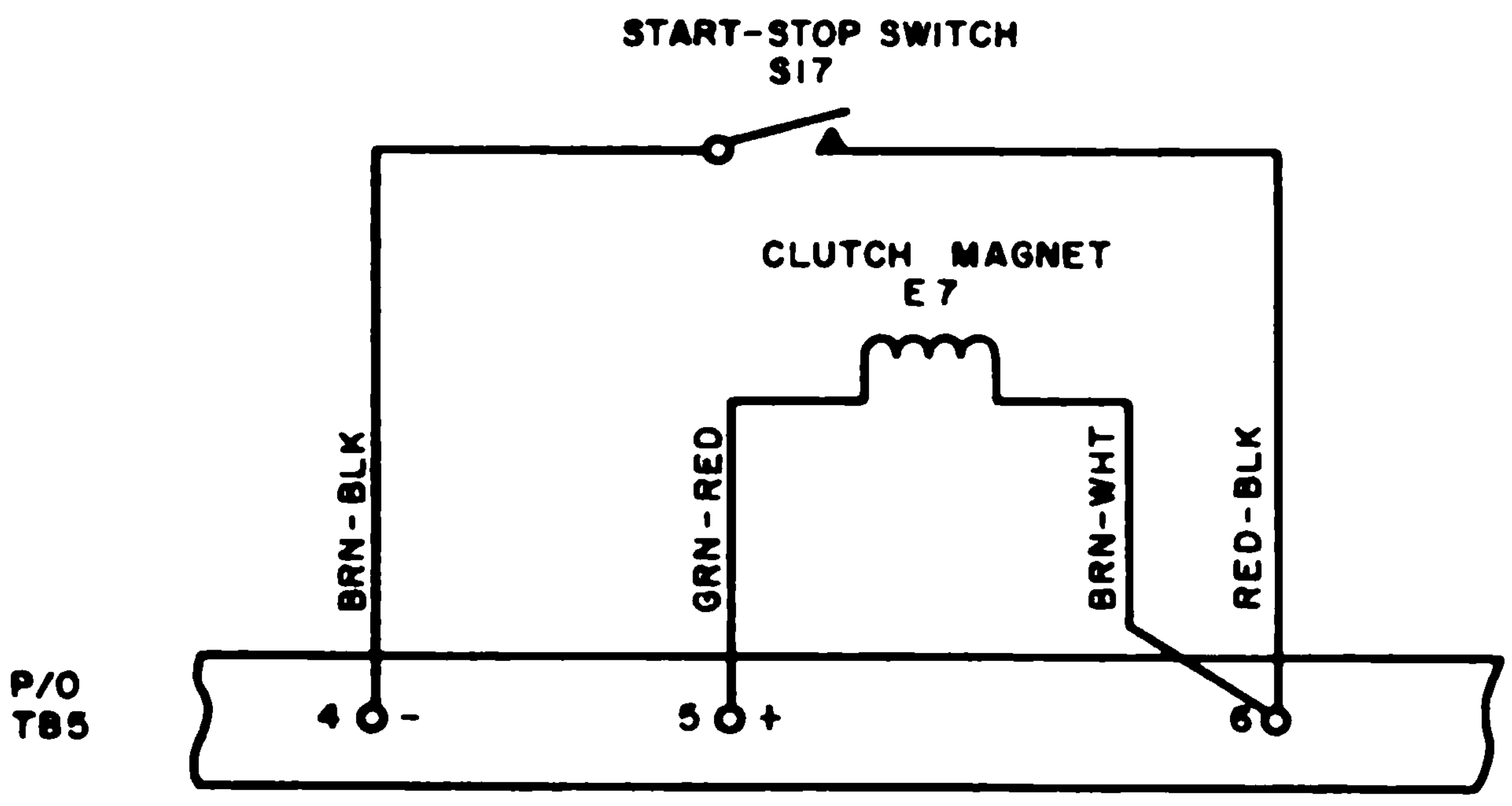
(5) From the rear of the reperforator-transmitter, route the cable from the associated COMSEC equipment between the transmitter-distributor and the reperforator-transmitter, through the tunnel at the bottom-center of the transmitter-distributor, under the cable that is connected to the start-stop switch, and bring the cable leads to the front of terminals 7 and 8 on the terminal board. Connect the positive side of the external power source to terminal 8 and connect the external control device in series with the negative side of the power source and terminal 7.

(6) Test across terminals 7 and 8 of the terminal board to make sure the start-stop switch functions properly.

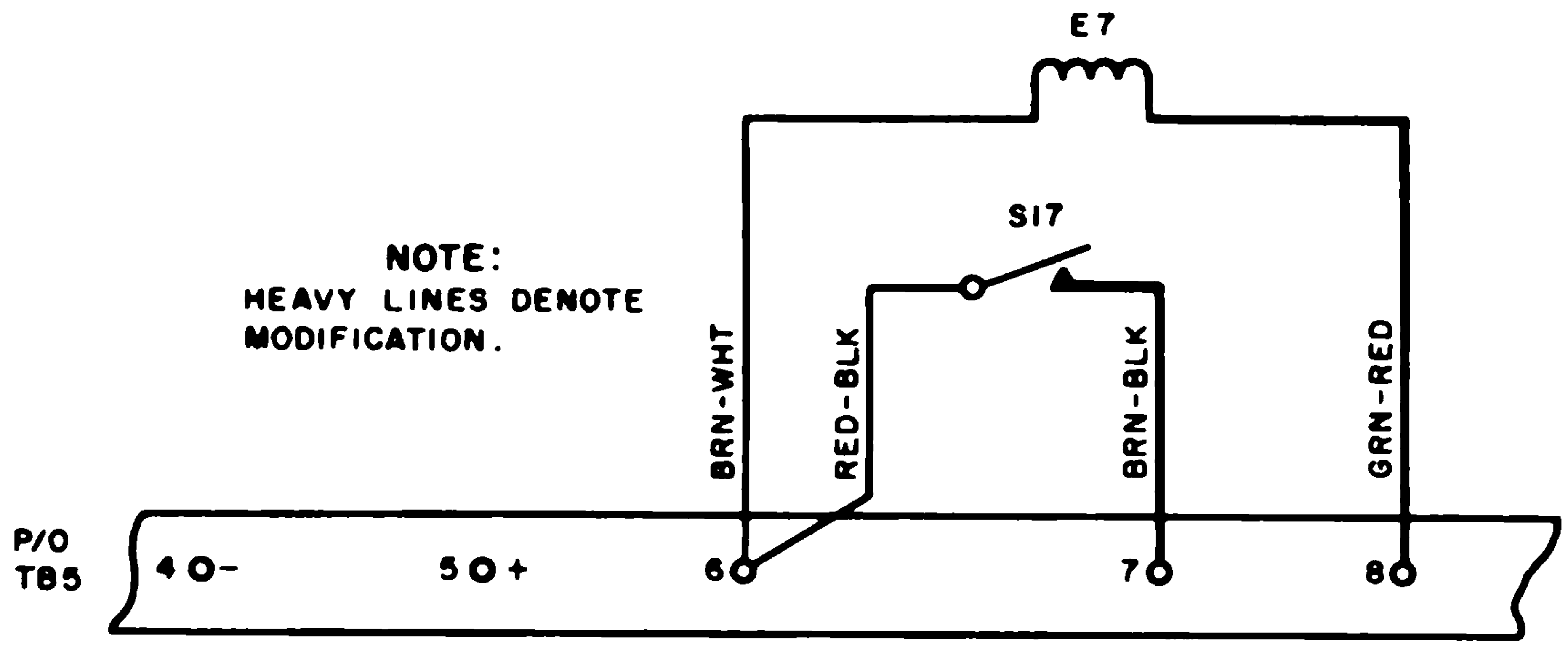
(7) Check the overall performance of the equipment.

(8) Attach the outside cover to the transmitter-distributor.

(9) Fasten the front plate to the transmitter-distributor frame; use the two original screws, lockwashers, and bushings.



A. ORIGINAL WIRING



B. MODIFIED WIRING

*Figure 4-11. Original and modified terminal board wiring (TT-178/FG and TT-179/FG ).*

c. *Reperforator-Transmitters TT-178A/FG, TT-179A/FG, and TT-181/FG.*

(1) Locate the BRN-WHT and BRN-BLK leads connected between terminal 4 of terminal board TB202 and clutch magnet L204 and start-stop switch S205, respectively (A, fig. 4-12).

(2) Remove the end of the BRN-WHT and BRN-BLK leads connected to terminal 4 and connect them to the rear of terminal 6 on terminal board (B, fig. 4-12).

(3) Locate the RED-BLK lead connected between terminal 5 of the terminal board and the start-stop switch (A, fig. 4-12).

(4) Remove the end of the RED-BLK lead connected to terminal 5 and connect it to the rear of terminal 7 on the terminal board (B, fig. 4-12).

(5) Locate the GRN-RED lead connected between terminal 5 of the terminal board and the clutch magnet (A, fig. 4-12).

(6) Remove the end of the GRN-RED lead connected to terminal 5 and connect it to the rear of terminal 8 on the terminal board (B, fig. 4-12).

(7) Remove the blank terminal lug from the normally open contact terminal of start-stop switch S205 (C, fig. 4-12).

(8) Remove the end of the BRN-BLK lead connected to the normally closed contract terminal of the start-stop switch and connect it to the normally open contact terminal of the switch (C, fig. 4-12).

(9) Install the terminal lug (previously removed from the normally open contact terminal of the switch) on the normally closed contact terminal of the switch).

(10) From the rear of the reperforator-transmitter, route the cable from the associated COMSEC equipment between the transmitter-distributor and the reperforator-transmitter, through the tunnel at the bottom-center of the transmitter-distributor, under the cable that is connected to the start-stop switch, and bring the cable leads to the front of terminal 7 and 8 on the terminal board. Connect the positive side of the external power source to terminal 8 and connect the external control device in series with the negative side of the power source and terminal 7.

(11) Test across terminals 7 and 8 of the terminal board to make sure the start-stop switch functions properly.

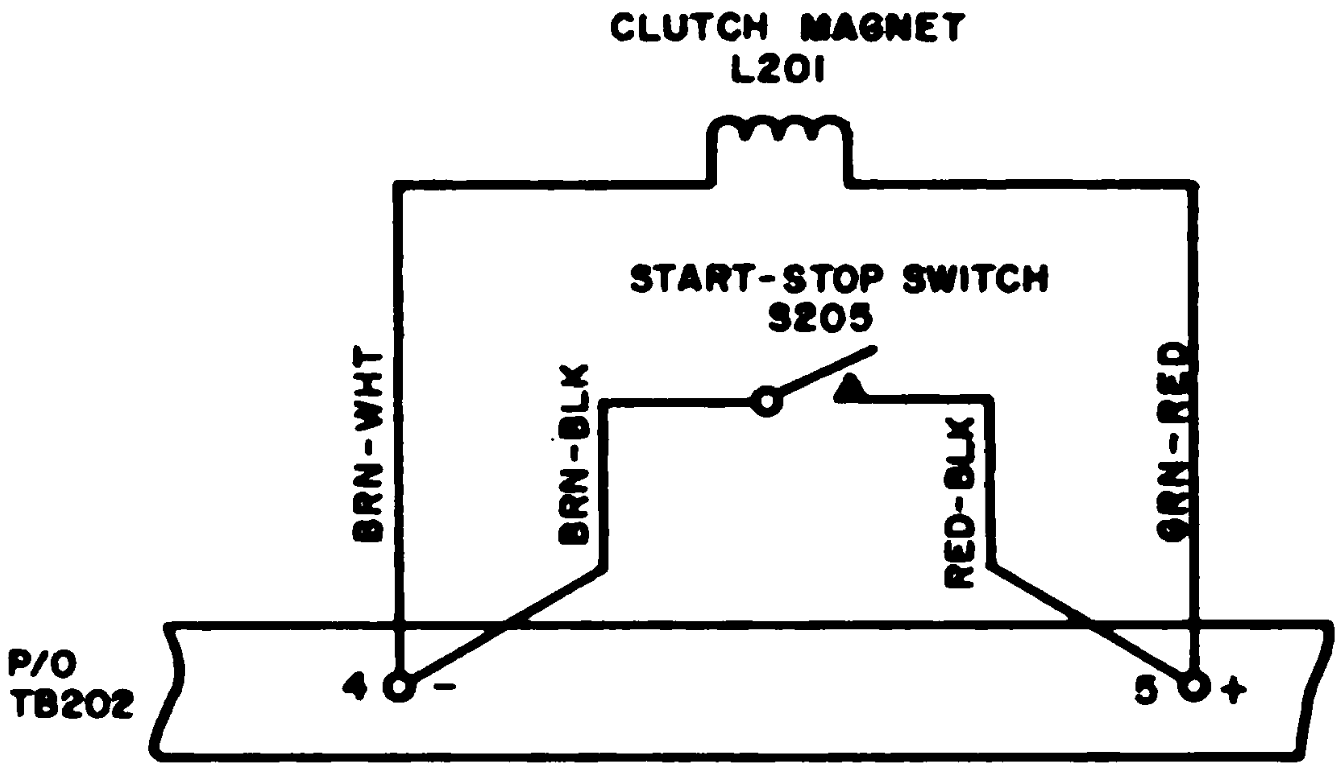
(12) Check the overall performance of the equipment.

(13) Attach the outside cover to the transmitter-distributor.

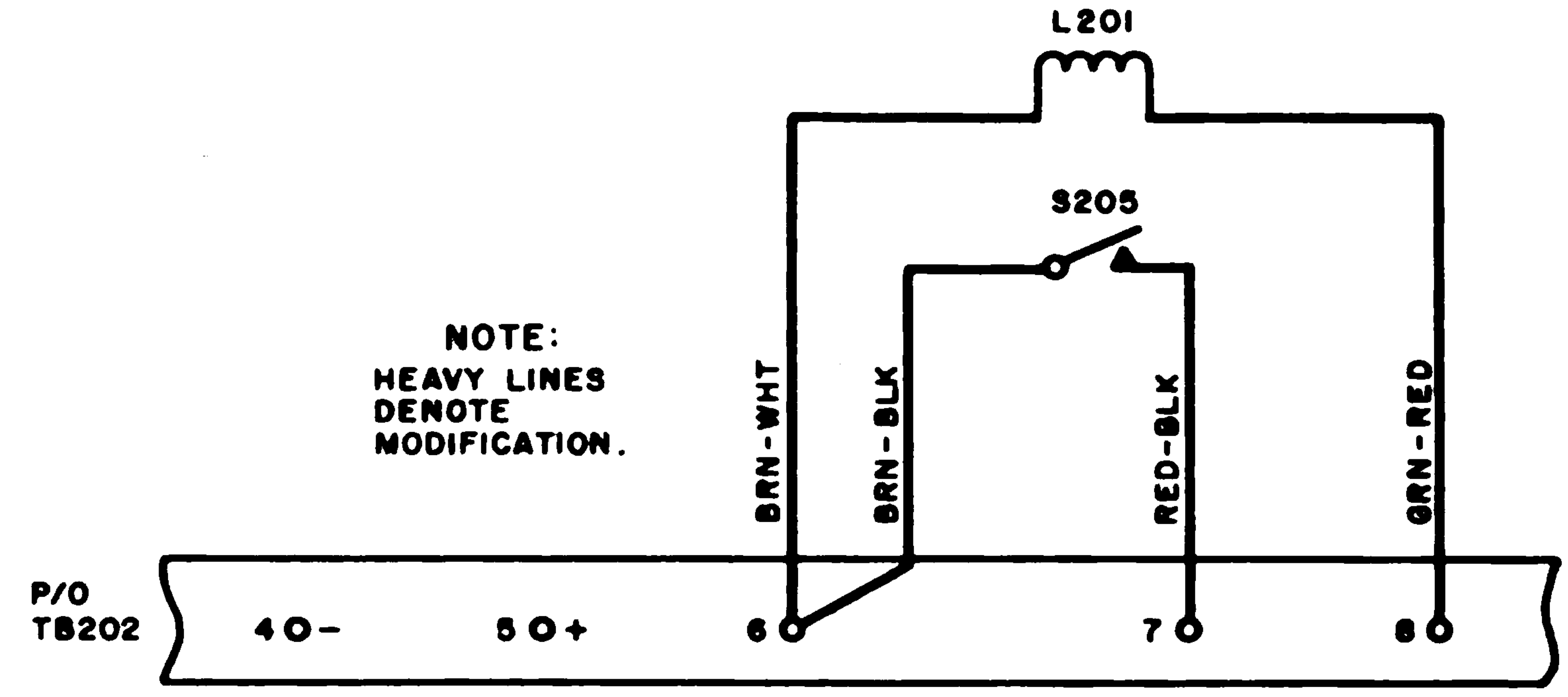
(14) Fasten the front plate to the transmitter-distributor frame; use the two original screws, lockwashers, and bushings.

NOTE

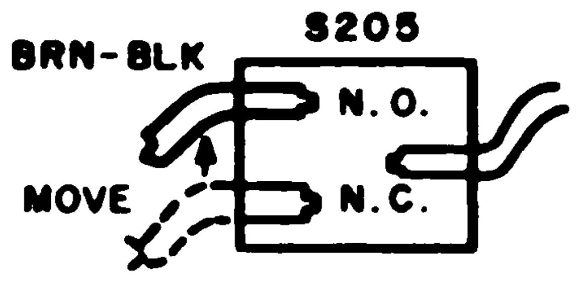
Return the wiring to its original position when the transmitter-distributor is disassociated from the COMSEC equipment.



A. ORIGINAL WIRING



B. MODIFIED WIRING



C. SWITCH TERMINALS

*Figure 4-12. Original and modified terminal board wiring (TT-178A/FG, TT-179A/FG, and TT-181/FG).*

# CHAPTER 5

# SHIPMENT AND LIMITED STORAGE

## Section I. SHIPMENT AND LIMITED STORAGE

### 5-1. Disassembly of Equipment

Prepare the teletypewriter set for storage in the following steps:

*a.* Disconnect the signal and power cords.

*b.* Disconnect all cords and cables connecting the page printing mechanism to the perforator.

*c.* Remove the paper roll of fanfold forms from the page printing mechanism and the tape roll from the perforator.

*d.* Empty the chad bin and spent tape box.

*e.* Remove the extra copyholder from the page printing mechanism.

*f.* Remove the page printer and the perforator from the table.

*g.* Remove the spent tape guide and tape storage guide from the table.

*h.* Remove the line relay adapter box from the table.

*i.* Move the carriage to the left-hand margin; lock it in place with the carriage lock at the left of the carriage guide rail. Lock the platen in place with the lock at the upper right of the page printer frame.

*j.* Remove the two self-locking hexagonal nuts that hold the blocking plate in the machine operating position (B, fig. 2-5). Remove the blocking plate and rotate it to the shipping position (A, fig. 2-5); make sure that the blocking plate is in full engagement between two of the teeth on the carriage-return driving gear. Replace and tighten the self-locking hexagonal nuts.

### 5-2. Repackaging Equipment for Shipment or Limited Storage

Pack the equipment for storage as follows:

*a.* Secure the page printer to the shipping base board and place it in the shipping and storage case.

*b.* Secure the perforator to the shipping base board and place it in the shipping and storage case.

*c.* Seal both of the cases with gummed tape.

*d.* Wrap the cases with a vapor barrier material and insert each case into a second shipment and storage box.

*e.* If the equipment is to be stored for a considerable length of time, place a sufficient amount of desiccant near the equipment to prevent any damage by desiccant. Use silica gel or other approved moisture.

*f.* If the shipment is to be over a great distance or extremely rough terrain, the units should be placed in wooden containers.

NOTE

> When packing equipment, refer to paragraph 2-2 and reverse the procedure described.

*g.* Pack the running spares, instruction books, spent tape guide, tape storage guide, copyholder, and line relay adapter box in a cardboard carton; place the carton in the spent tape and chad bin. Position the chad bin in the bottom of the table.

*h.* Install the necessary filler strips on the table and position the table in the shipping and storage case; seal the case gummed tape.

*i.* Place the table package in a wooden box if it is to be shipped a great distance or over rough terrain.

Section II deleted

# APPENDIX A

# REFERENCES

| | |
|---|---|
| DA Pam 310-1 | Consolidated Index of Army Publications and Blank Forms. |
| TM 11-5500 | Multimeter TS-297/U |
| TM 11-6625-366-15 | Operator's, Organizational, DS, GS, and Depot Maintenance Manual: Multimeter TS-352B/U (NSN 6625-00-553-0142). |
| TM 38-750 | The Army Maintenance Management System (TAMMS). |
| TM 740-90-1 | Administrative Storage of Equipment. |
| TM 750-244-2 | Procedures for Destruction of Electronics Materiel to Prevent Enemy Use. |

# APPENDIX C

# MAINTENANCE ALLOCATION

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## Section I. INTRODUCTION

### C-1. General

This appendix provides a summary of the maintenance operations covered in the equipment literature. It authorizes categories of maintenance for specific maintenance functions on repairable items and components and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations.

### C-2. Maintenance Functions

Maintenance functions will be limited to and defined as follows:

*a. Inspect.* To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination.

*b. Test.* To verify serviceability and to detect incipient failure of measuring the mechanical or electrical characteristic of an item and comparing those characteristics with prescribed standards.

*c. Service.* Operations required periodically to keep an item in proper operating condition, i.e., to clean, preserve, drain, paint, or to replenish fuel/lubricants/hydraulic fluids or compressed air supplies.

*d. Adjust.* Maintain within prescribed limits by bringing into proper or exact position, or by setting the operating characteristics to the specified parameters.

*e. Align.* To adjust specified variable elements of an item to about optimum or desired performance.

*f. Calibrate.* To determine and cause corrections to be made or to be adjusted on instruments or test measuring and diagnostic equipment used to precision measurement. Consists of the comparison of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

*g. Install.* The act of emplacing, seating or fixing into position an item, part, module (component or assembly) in a manner to allow the proper functioning of the equipment/system.

*h. Replace.* The act of substituting a serviceable like-type part, subassembly, module (component or assembly) in a manner to allow the proper functioning of an equipment/system.

*i. Repair.* The application of maintenance services (inspect, test, service, adjust, align, calibrate, replace) or other maintenance actions (welding, grinding, riveting, straightening, facing, remachining, or resurfacing) to restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module/component/assembly, end item or system.

*j. Overhaul.* That maintenance effort (service/action) necessary to restore an item to a completely serviceable/operational condition as prescribed by maintenance standard (e.g. DMWR) in pertinent technical manuals. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like-new condition.

*k. Rebuild.* Consists of those services/actions necessary for the restoration of unserviceable equipment to a like-new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (hours, miles, etc.) considered in classifying Army equipment/components.

*l. Symbol.* The uppercase letter placed in the appropriate column indicates the lowest level at which that particular maintenance function is to be performed.

### C-3. Explanation of Format

*a. Group Number.* Column 1 lists group numbers, the purpose of which is to match components, assemblies, subassemblies, and modules with the next higher assembly.

*b. Functional Group.* Column 2 lists the next higher assembly group and the item names of components, assemblies, subassemblies, and modules within the group for which maintenance is authorized.

*c. Maintenance Functions.* Column 3 lists the twelve maintenance functions defined in C-2 above. Each maintenance function required for an item is specified by the symbol among those listed in *d* below which indicates the level responsible for the required maintenance. Under this symbol is listed an appropriate work measurement time value determined as indicated in *e* below.

*d. Use of Symbols.* The following symbols are used to prescribe work function responsibility:

C – Operator/Crew
O – Organization
F – Direct Support
H – General Support
D – Depot

*e. Work Measurement Time.* The active repair time required to perform the maintenance function is included directly below the symbol identifying the category of maintenance. The skill levels used to obtain the measurement times approximate those found in typical TOE units. Active repair time is the average aggregate time required to restore an item (subassembly, assembly, component, module, end item or system) to a serviceable condition under typical field operating conditions. This time includes preparation time, fault isolation/diagnostic time, and QA/QC time in addition to the time required to perform specific maintenance functions identified for the tasks authorized in the maintenance allocation chart. This time is expressed in man-hours and carried to one decimal place (tenths of hours).

*f. Tools and Test Equipment.* This column is used to specify, by code, those tools and test equipment required to perform the designated function.

*g. Remarks.* Self-explanatory.

## C-4. Explanation of Format of Table I and Test Equipment Requirements

The columns in table I follows:

*a. Tools and Equipment.* The numbers in this column coincide with the numbers used in the tools and equipment column of the maintenance allocation chart. The numbers indicate the applicable tool for the maintenance function.

*b. Maintenance Category.* The codes in this column indicate the maintenance category normally allocated the facility.

*c. Nomenclature.* This column lists tools, test, and maintenance equipment required to perform the maintenance functions.

*d. Federal Stock Number.* This column lists the Federal stock number of the specific tool or test equipment.

*e. Tool Number.* Not used.

## SECTION II. MAINTENANCE ALLOCATION CHART

| (1) GROUP NUMBER | (2) FUNCTIONAL GROUP COMPONENT ASSEMBLY NOMENCLATURE | (3) MAINTENANCE FUNCTIONS | | | | | | | | | | | (4) TOOLS AND EQUIPMENT | (5) REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | INSPECT | TEST | SERVICE | ADJUST | ALIGN | CALIBRATE | INSTALL | REPLACE | REPAIR | OVERHAUL | REBUILD | | |
| 00 | TELETYPEWRITER SETS AN/FGC-25;<br>AN/FGC-25X | | | C<br>0.3 | | | | | | | | | | Exterior parts |
| | | | | F<br>0.5 | | | | | | | | | 5,6 | Interior parts |
| | | | | | C<br>0.3 | | | | | | | | | Rangefinders, Motor speed (If applicable) |
| | | | | | | | | O<br>4.0 | | | | | 1,5 | |
| | | | | | F<br>0.6 | | | | | | | | 5,6 | All adjustments |
| | | C<br>0.2 | | | | | | | | | | | | Exterior parts |
| | | F<br>0.5 | | | | | | | | | | | 2,5,6 | Interior parts |
| | | | C<br>0.3 | | | | | | | | | | | Local test utilizing built-in test circuit |
| | | | F<br>0.6 | | | | | | | | | | 2 thru 6 | Performs resistance, voltage and current measurements to determine condition of circuits and test system line-up procedures, conducts distortion tests |
| | | | H<br>0.6 | | | | | | | | | | 2 thru 7 | Conducts all tests to insure equipment returned to user meets minimum measurements, visual electrical and operational requirements. |
| | | | | | | | | | | | D<br>12.0 | | 5,6 | |

## SECTION II. MAINTENANCE ALLOCATION CHART

| (1) GROUP NUMBER | (2) FUNCTIONAL GROUP COMPONENT ASSEMBLY NOMENCLATURE | (3) MAINTENANCE FUNCTIONS | | | | | | | | | | | (4) TOOLS AND EQUIPMENT | (5) REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | INSPECT | TEST | SERVICE | ADJUST | ALIGN | CALIBRATE | INSTALL | REPLACE | REPAIR | OVERHAUL | REBUILD | | |
| 01 | REPERFORATOR-TRANSMITTER TELETYPEWRITER TT-178/FG; TT-178A/FG; TT-179/FG; TT-179A/FG | | | | | | | | | F 1.0 | | | 5,6 | |
| | | | | | | | | | | | | D 8.0 | 5,6 | |
| | | | | | | | | | | | H 6.0 | | 5,6 | |
| 0101 | MOTORS | | | | | | | | F 0.5 | | | | 5,6 | |
| | | | | | | | | | | F 0.5 | | | 5,6 | External parts only |
| | | | | | | | | | | | H 1.5 | | 5,6 | |
| 010101 | GOVERNOR ASSEMBLY (P/O TT-178/FG; TT-178A/FG) | | | | | | | | F 0.3 | | | | 5,6 | |
| | | | | | | | | | | F 0.5 | | | 5,6 | |
| 02 | TABLE, TELETYPEWRITER, FN-65/FG | | | | | | | | | F 0.3 | | | 5,6 | |
| | | | | | | | | | | | D 2.0 | | 5,6 | |
| 03 | TELETYPEWRITER TT-117/FG; TT-117A/FG; TT-117B/FG; TT-119/FG; TT-119A/FG; TT-119B/FG | | | | | | | | | F 1.0 | | | 5,6 | |
| | | | | | | | | | | | | D 8.0 | 5,6 | |
| | | | | | | | | | | | H 6.0 | | 5,6 | |
| 0301 | MOTORS | | | | | | | | F 0.5 | | | | 5,6 | |
| | | | | | | | | | | F 0.5 | | | 5,6 | External parts only |
| | | | | | | | | | | | H 1.5 | | 5,6 | |
| 030101 | GOVERNOR ASSEMBLY (P/O TT-119/FG; TT-119A/FG; TT-119B/FG) | | | | | | | | F 0.3 | | | | 5,6 | |
| | | | | | | | | | | F 0.5 | | | 5,6 | |

## TABLE I. TOOL AND TEST EQUIPMENT REQUIREMENTS

| TOOLS AND EQUIPMENT | MAINTENANCE CATEGORY | NOMENCLATURE | FEDERAL STOCK NUMBER | TOOL NUMBER |
|---|---|---|---|---|
| | | TELETYPEWRITER SETS AN/FGC-25, AN/FGC-25X | | |
| 1 | O | MULTIMETER AN/URM-105 | | |
| 2 | F, H, D | MULTIMETER TS-352/U | | |
| 3 | F | TEST SET TS-2/TG | | |
| 4 | H, D | TEST SET TELETYPEWRITER | | |
| 5 | O, F, H, D | TOOL EQUIPMENT TE-50B | | |
| 6 | F, H, D | TOOL EQUIPMENT TE-111 | | |
| 7 | H, D | VOLTMETER, METER ME-30/U | | |

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For explanation of abbreviations used, see AR 310-50.

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